American Machinist

April 21, 1937

"Village Industry" — Oldest plant in Ford's decentralization scheme is at Northville, makes valve stems as described on page 320. Shown is a double row of centerless grinders finishing valve stems.

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ANNOUNCEMENT

June 16th Issue of American Machinist

THE ANNUAL MODERN PLANT NUMBER FOR 1937 will tell the inside story of International Business Machines Corporation. Every year American Machinist selects a plant which has made an outstanding success . . . which represents the very best in metal manufacturing practice . . . to be the subject of its Annual Modern Plant Number. An entire issue is devoted to it. The editors spend months studying the company and its operations from the inside out. They present a complete and accurate picture of the manufacturing organization and the policies controlling its operation.

This year, it is International Business Machines Corporation, whose main plant is at Endicott, N. Y. This efficient and modern organization made money all through the Depression . . . is making new high records for itself today. Surely this is no accident. What are the management and manufacturing policies that have contributed to it?

The management of the International Business Machines Corporation has consented to let the story be told, and is co-operating to the full.

The outstanding record of this organization commands the interest of the entire metal-working industry. Our interpretation of the underlying reasons for its great manufacturing success will be eagerly read by every responsible man in the metal-working field.

We consider it a privilege to present this exclusive story of International Business Machines Corporation.

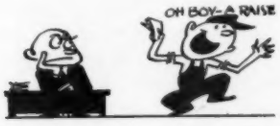
AMERICAN MACHINIST

Talking Shop

Don't Forget Salaries

You can hardly pick up a newspaper these days without seeing a whole flood of reports of wage increases. They are being made in all sorts of industries and in all sorts of ways. Sometimes they are just announced without any preliminaries or any discussion with the men involved. At other times they are the result of thoughtful discussion between the management and the men or their representatives. Still others are caused by "economic pressure."

As costs of living rise, wage costs must go up too and they should at least keep pace. We don't propose to discuss here how such wage increases should be handled but we do want to say a word of warning to managements that have given all the increases to the hourly workers and ignored the salaried men. These fellows who get salaries have a security



in their jobs that is denied to the hourly workers but most of them have families and they have to pay food and clothing and rent bills. These items in their family budgets go up with the recovery curve just as the same items do in the wage earner's budget. Furthermore, the salaried men are the key in any organization and this statement is particularly true of the foreman. The management that wants to insure loyalty through continued satisfaction on the part of these men will take care that the differential between the salaried man and the wage earner stays about where custom has placed it. Otherwise serious trouble is ahead.

"We Want a Bonus"

Something over a year ago a shop doped out a bonus system that looked workable. Without much fuss or ballyhoo it was introduced into one department to see what would happen. For a long time nothing did happen. The men in this department pocketed their extra money, took it home and apparently said little about it around the shop. But the shop grapevine worked as usual and the word got around.

About two weeks ago, at a foreman's meeting, one foreman put in a complaint. Said his men were getting hard to handle, that they wanted to get into this bonus department. He suggested putting a fence around it if the company insisted on limiting bonuses to these particular men. The works manager concealed his satisfaction and agreed, as a favor, to discuss a bonus plan for other departments that wanted it.

It may take a long time to have a situation work out this way, but it is time well spent.

Round Rings

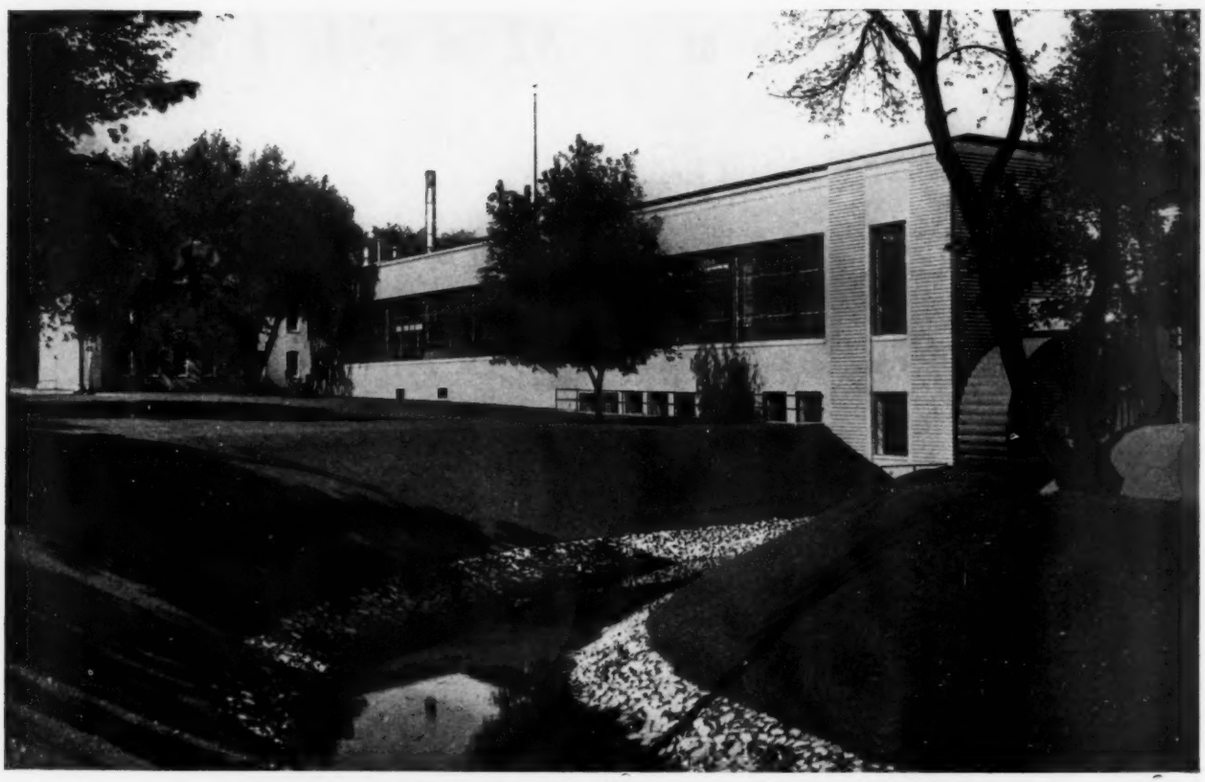
Spinning rings for textile machines are made of pressed steel and must be heat-treated. These rings get out of round upon application of heat, and they cannot be made to assume a true circle again by driving them over a plug. The design is such that the rings cannot be internally ground, and some means must be found to prevent the out-of-roundness in the first place. This is done by loading on a cast-iron plug before putting them into the furnace; after quenching they are found to be truly circular and require no further treatment except polishing.

Getting Out What Was Built In

One of the smartest manufacturing executives we know insists that very few shop or department managers get out of a machine tool what its makers built into it in the way of production. Long experience with less powerful or capable machines is probably largely responsible for reluctance to push a new machine to its limit. But it is certainly poor economy in a production job to use machines at half capacity. Most of them are replaced because of design obsolescence long before they are worn out by use.

This practice is particularly prevalent in the toolroom where the toolmaker by tradition prefers to remove metal a little at a time. Doing it this way does not save an accurate machine. In fact it may do just the reverse. The material might be removed by one roughing cut and one finishing cut with considerably less wear and tear on the machine than would be occasioned by half a dozen nibbles.

Even the machine tool builders themselves don't always know the true capacities of their products. Consequently the shop executive worth his keep will experiment continually to see just how far he can go in stepping up speeds and feeds on a given machine in a given material, and will not be satisfied until he knows by trying it just where these factors should stand.—*The Editors.*



Ford's New Northville plant where 400 men manufacture motor valves

Ford Decentralizes

Believing that a country home with a city income is the ideal set-up for the factory worker, Henry Ford has plans for a total of 50 "village industries" within a radius of 65 miles of Dearborn. Eleven of these small plants are now in operation. All fifty will manufacture light parts for the Ford V-eight car. Castings or forgings are shipped by truck from the Rouge plant and finished parts returned in the same way. The Northville plant, oldest of the village industries, began operations in 1920. Last year it was moved into a new building, air conditioned and equipped with all new machinery

BURNHAM FINNEY
Western Editor

NOT SO long ago America's countryside was dotted with small factories which made a variety of products. With the growth of large cities and development of centralized industries, however, they began to disappear. For the last 17 years Henry Ford has been attempting "to give industry back to the countryside" by establishing a chain of so-called village industries in southern Michigan. Each plant is in or near a small town and employs up to 400 workers in the manufacture of automotive parts which are trucked to the Rouge plant at Dearborn or are shipped to Ford's branch assembly plants. There are now 11 of these village industries and their number is constantly increasing.

Back in 1920 Mr. Ford built the first of these factories at Northville, Mich., for the production of Ford valves. In its 16 years of operation, this plant made over 181,000,000 valves. It recently has been replaced by a new building which is a model of what a small plant, employing 400 men, should be. For the comfort of the workers, it is air conditioned. It is equipped with 120 production machines of the latest design, of which 65 are centerless grinders and 26 are hydraulic valve face grinders. Overhead conveyors take work from one operation to the next. Final inspection is in a constant temperature room. The one-story, brick-and-steel structure is 100x200 ft. and contains 30,640 sq.ft. of floor space. Under it is a half basement housing power plant equipment, compressors, blowers and other machinery. The plant is capable of making 70,000 valves for the Ford V-8 and Lincoln-Zephyr cars in 16 hr., whereas in the old plant it took 24 hr. to turn out the same volume.

Equipment is arranged in rows lengthwise of the shop, rough cast valves coming in at the northwest end and finished valves being inspected and packed at the southwest

end. In the manufacturing process the work progresses up one row of machines and down another until it travels the complete round of operations.

The periphery on the head end of valves is ground in one pass on No. 2 centerless grinders, 0.010 in. of stock being removed. Each machine (there is a battery of 3) has a special rotary fixture which contains 24 valves. A special belt drive rotates the valves as they move by the grinding wheel. Work is held to the following limits: size 0.0020 in.; roundness 0.0005 in.; and concentricity 0.0010 in. Production per machine is 1680 valves per hour.

Three machines of similar type are used to grind the foot or mushroom head of the valves in a single pass.

The taper adjoining the mushroom head is ground on a battery of No. 2 centerless grinders. About 0.015 in. of stock is removed in the rough grind and 0.005 in. in the finish grind. Valve stems are rough and finish ground on a battery of 49 No. 2 centerless machines. In the rough grind 0.008 in. of stock is removed, and in the finish grind 0.003 in. The work is held to 0.0010 in. for size, 0.0001 in. for roundness and 0.0001 in. for straightness. Each machine turns out 600 valves per hour.

The top of the valve and the overall length are ground on a special straight-line grinder having five heads on one side and three on the other. Each wheel is mounted on a slide which moves forward by means of rack, pinion and electric solenoid, the travel being limited by micrometer stop screws. Each wheel is of the cylinder type and is 14 in. in diameter. It is driven through sheaves and vee belts from a 10-hp., 1,800-r.p.m. motor. Work fixture blocks are mounted on the chain which carries the valves past the row of grinding wheels on each side. Valves are automatically clamped in the hardened stations of the chain fixture. The head end of the valve is on the wheel side of the machine.

In passing by the grinding wheels, the ground surfaces of valves must go by an automatic sizer (there is one for every grinding wheel head). The pointer arrangement of the sizer is hooked up electrically by a solenoid device for operating the stop screw of each grinding wheel head. If the work passes one wheel and is not down to size, it contacts the pointer for that wheel head and automatically allows it to move forward in increments of 0.0002 to 0.003 in. The fixture chain moves 20 ft. a minute, the machine handling around 1,800 valves per hour. Grinding is done wet.

Forty-five degree valve seats are rough and finish ground on a battery of hydraulic valve face grinders. Since they are semi-automatic, the operator's only job is to load and unload them and manipulate one control. Operation of the machine is substantially as follows: the end of the valve stem is inserted in a finger-type chuck, work rotation being controlled so that the chuck stops in the correct loading and unloading position. The operator pushes the valve control knob at the front of the work head. Immediately the work is clamped, causing the rotation to begin. The work feeds toward the wheel rapidly until the valve face is about to come in contact with the wheel. At this point the feeding-in movement slows down to a predetermined grinding feed and continues until the work head comes against a positive stop, indicating that the work has been ground to size. Pulling the valve control knob in the reverse direction causes the work head to move back rapidly and the chuck jaws to release. The operator removes the valve and loads another, after which the same cycle is repeated.

Unlike the majority of precision grinding operations, in this case the work is fed toward the wheel. This movement as well as the work clamping is done hydraulically. Grinding

Valves come to the inspection bench by conveyor, roll down chute to inspector who checks face of valve foot and seat angle in indicator gage. Inspectors facing camera are checking roundness of stem to a limit of 0.0002 in.

wheel reciprocation makes for a better finish and more uniform wheel wear. The live spindle work head is mounted at an angle of 45 deg. on a cross slide which moves at right angles to the axis of the grinding wheel. Locating is from the end of the stem and against a stop within the chuck body. The valve may be inserted into the chuck a considerable distance, which means that the chuck jaws and finger act as a support for the stem. An 80N Alundum grinding wheel is used. It is dressed each hour, or for every 300 to 350 pieces. Limits are 0.001 in. for length and runout. Stock removal ranges from 0.005 to 0.015 in.

After passing through three grinding operations, valves move through a continuous gas-fired furnace built into the production line, where valve heads are heated to 1,650 deg. F. An operator loads the furnace conveyor, valves being placed at an angle so that the greatest possible number can be in the furnace at on time. At the discharge end of the furnace, hot valves are automatically dumped at a predetermined rate into a machine resembling an automatic forging machine. Here they are restruck.

Near the end of the production line valves are run through a washing machine on an overhead monorail conveyor. This machine is of the "degreasing" type, the work being transported through a fog of pure solvent vapors. The vapors condense on the cool metal, dissolving the oil and grease. The flow of the condensed solvent on the work carries off solid particles of dirt as well as oil and grease.

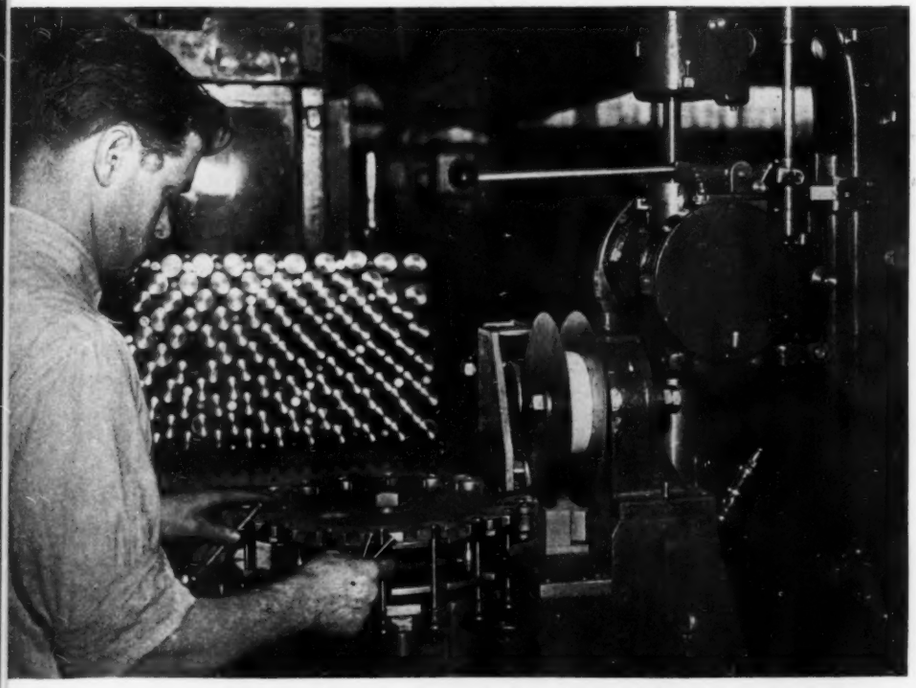
Special Inspection Gages

Valves are checked for size on visual amplifying gages. Final inspection in the constant temperature room is on special Ford gages which determine valve lengths. Valves are put into bins to conform to their length and those of the same length are packed together for shipment. In most manufacturing operations the work is held within limits of 0.0002.

Electricity and low-pressure steam for heating the plant are supplied by a completely coordinated power-generating plant incorporating a so-called Steamotive unit of 1,200 hp. capacity and a 750 kw. turbine-generator. Both are oil-fired. In the Steamotive unit steam is generated at high pressure and high temperature and is controlled automatically in response to changes in demand. Features of the installation are its light weight and small size for the amount of steam produced, the wide range of its capacity, and its adaptability to numerous fuels. It is one of only two units in operation in the United States.

Soluble oil coolant is pumped to grinding machines from a tank outside the plant by means of an elaborate piping system and after being used is drained back into the tank. Tile run lengthwise of the shop between each two rows of machines, above the floor level but covered by boiler plate. Auxiliary pipes lead to the individual machines. After draining back into the tank, the coolant is allowed to settle and the resulting sludge drawn off. Then a quantity of soluble oil equal to about 25 per cent of that originally used is added to the solution. There is a second tank for stand-by purposes. There are also two pumps, one as a precautionary measure.

Propane gas is employed instead of city gas as the pilot light for the boilers and for the continuous furnace for heating valve heads. Two air compressors provide air pressure of 100 lb. per sq.in. at each machine in the shop. Holophane overhead lights insure a close approach to daylight for night working conditions. Receiving and sending platforms are designed to eliminate all unsightly projections, such as overhead conveyers. They are artistically trimmed with stainless steel, the lights being recessed into the roof.



Polishing the bottom face of the valve stem foot in a special fixture

Some Water Power Used

Part of the power for the Northville plant, as for every one of Ford's village industries, is supplied by water. The River Rouge has been dammed to form an artificial lake, the water operating an overshot wheel.

Ford's experience has proved that it is not costly to set up small plants doing work formerly done under one roof along with other manufacturing processes. Transportation expense is low, with V-8 trucks used to make the short hauls to and from the Rouge plant at Dearborn. The spirit of the employees is notable and contributes to accurate and well-done work. Almost all employees are nearby residents, living on small farms. Most of them have large Ford garden plots and a number till several acres. As one observer has remarked, "Their security is produced by the machine and the farm together, not by one alone."

•

Some drivers say they like heavy cars because they hold the road. According to F. R. Fageol, whose wide experience in buses makes his opinion worth considering, weight of metals used is not nearly so important in automotive design as its distribution. This same observation holds in many other lines of industry as well.

Differential Indexing

A method of finding the gear ratio between spindle and worm by simple arithmetic has been developed and tested by practical experience

ADOLPH B. HARVEST
Oshawa, Ontario, Canada

TO MANY operators of universal milling machines, differential indexing appears to involve higher mathematics. By the methods described below, the set-up for divisions requiring differential indexing can usually be found in a few minutes by simple arithmetic. Even when tables are available it is safer to check the set-up by an independent calculation.

First make sure that the wanted number of divisions cannot be obtained by plain indexing. Then select a number that answers the following requirements:

1. A number that is slightly larger or smaller than the number of divisions wanted. The difference should not exceed 15 per cent.

2. A number that is obtainable by plain indexing.

Use an index circle that is divisible by 3, such as 15, 18, 21, 27 or 39. Set the index crank, sector and index plate as if the imaginary number chosen was to be indexed, but release the pin back of the index plate.

To find the gear ratio between spindle and worm, first write down a fraction the numerator of which is the number of holes in the index circle used, and the denominator of which is the number of holes the index crank is to be moved at each indexing.

EXAMPLE: for three holes in an 18-hole circle, write the fraction $\frac{18}{3}$.

Next to it write a fraction having 40 for its numerator and the number of divisions wanted for its denominator. Multiply the two fractions and subtract the denominator from the numerator. The remainder is the numerator of a fraction of which the denominator is the number of holes in the index circle. This last fraction is the ratio of the required gearing, its numerator giving the value of the gear on the spindle in simple gearing.

If the remainder is positive, the index plate must turn in the same direction as that of the index crank. If the remainder is negative, the index plate must turn in the opposite direction from that of the index crank. The proper direction is obtained by the use of one or two idler gears, as necessary. The idler gears do not affect the ratio of the gearing, but only the relative direction of movement between the index crank and the index plate.

EXAMPLE: Wanted, 113 divisions. Use 33 circle of holes, turning the crank 12 holes per indexing as for 110 divisions in plain indexing. Then,

$$\frac{33}{12} \times \frac{40}{113} = \frac{1320}{1356}$$

And 1320 — 1356 = —36.

$$\text{Ratio of gearing} = -\frac{36}{33}$$

$$\frac{36}{33} = \frac{3 \times 12}{3 \times 11} = \frac{12}{11} = \frac{4 \times 12}{4 \times 11} =$$

48 gear on spindle.
44 gear on worm.

Since the remainder found by subtraction is a negative number and the gearing is simple, two idlers are placed between the gear on the spindle and the gear on the worm to cause the index plate to turn in the opposite direction to that of the index crank.

Many divisions requiring differential indexing can be obtained by several different set-ups. If suitable gears to generate the ratio obtained by one calculation are not available, another calculation employing a different index circle should be tried.

Here is another calculation for 113 divisions, and others are possible.

Use 18-hole circle, turning the index crank 6 holes per indexing as for 120 divisions in plain indexing. Then,

$$\frac{18}{6} \times \frac{40}{113} = \frac{720}{678}$$

And 720 — 678 = 42

$\frac{42}{18}$ = ratio of gearing.

$$\frac{42}{18} = \frac{6 \times 7}{6 \times 3} = \frac{7}{3} = \frac{8 \times 7}{8 \times 3} =$$

56 gear on spindle.
24 gear on worm.

The use of one idler gear is indicated by the remainder found by subtraction being a positive number.

One more example will suffice.

Wanted, 239 divisions. Use 18-hole circle, turning the index crank 3 holes per indexing as for 240 divisions by plain indexing. Then,

$$\frac{18}{3} \times \frac{40}{239} = \frac{720}{717}$$

And 720 — 717 = 3

$\frac{3}{18}$ = ratio of gearing.

Since there are no two gears in the standard set that can be combined to generate the ratio of 3 to 18, it becomes necessary to employ compound gearing. As the ratio of simple gearing can be expressed by means of a fraction, so the ratio of compound gearing can be expressed by the multiplication of two fractions, the product of which equals the desired ratio. The object then is to find two fractions, the product of which will equal the ratio of 3 to 18, and which contain factors the ratio of which can be obtained among the available gears.

$\frac{3}{18} = \frac{3}{6} \times \frac{1}{3}$ or $\frac{1}{2} \times \frac{1}{3}$. The ratio ½ may be obtained by the 28 and 56 gears. The ratio ⅓ can be obtained by the 24 and the 72 gears.

We then have ratios of $\frac{28}{56} \times \frac{24}{72}$.

That this gearing is correct may be proved by multiplication and subsequent reduction, thus:

$$\frac{28}{56} \times \frac{24}{72} = \frac{672}{4032} = \frac{3 \times 224}{18 \times 224} = \frac{3}{18}.$$

The gears are placed in the following order:

28 gear on spindle.
24 second gear on stud.
56 first gear on stud.
72 gear on worm.

No idler gears are needed as the two gears on the stud function in the place of the idler gear that would have been required if the ratio of 3 to 18 could have been obtained by simple gearing.

If it is found that a train of compound gears will not mesh in the order given, it is useful to know that

the gear on the spindle may change places with the second gear on the stud and that the first gear on the stud may change places with the gear on the worm without affecting the ratio. That such rearrangement is permissible can be shown as follows:

$$\frac{28}{56}\times\frac{24}{72}=\frac{24}{56}\times\frac{28}{72}=\frac{28}{72}\times\frac{24}{56}=\frac{24}{72}\times\frac{28}{56}.$$

It applies to all multiplications of fractions and therefore to the order in which compound gearing may be arranged.

When a dividing head is set up for differential indexing and the index plate is geared to turn in the same direction as that of the index crank, there is unavoidable lost motion in the index plate. This lost motion must be taken up at each indexing or the spaces will vary. Turn the crank and place the pin in the proper hole, then gently turn both the crank and the plate until the lost motion has been taken up. Then clamp the head and start the cut. If the dividing head is not equipped with a clamp, place a piece of leather or similar material in a position where it will act as a slight brake on the index plate and thus prevent it from turning backward due to vibration.

It is an easy matter to make calculations to prove that the indexing mechanism has been correctly set for any given number of divisions obtainable by plain indexing.

Example: wanted 124 divisions. The pin in the indexing crank has been set to engage the holes in the 31-hole circle and the sector has been set for turning the index crank 10 holes at each indexing, as per table. Then,

$$\frac{31}{10}\times\frac{40}{124}=\frac{1240}{1240}.$$

When the numerator and the denominator of the product are identical, the set-up is correct.

Precision Boring on Standard Equipment

FRANCIS W. SHAW
Broadley, Lancashire, England

THIS article is suggested by several experiences where slight dimensional alterations enabled work to be performed with standard equipment or equipment less costly than would have otherwise been needed. The principle expounded depends upon the theorem that a circle can be described through any three points not in the same straight line.

A number of pieces in which holes at *A*, *B* and *C* had to be bored are represented by Fig. 1. The tolerances of dimensions *a* and *c* were close, dimension *b* was unimportant.

The planner remarking that the angle at *B* was nearly a right angle and that the angles θ and ϕ were about 60 and 120 deg., respectively, induced the designer to have them so marked, and the dimension *b* altered to match but left untoleranced.

The work was planned to be drilled and rough and finish bored, the tools being held in the spindle of a plain milling machine equipped with a dividing head. The dividing head was set with its spindle parallel with the machine spindle and at a distance below it equal to the radius *r*, the distance being measured over two arbors, one in the machine spindle and the other in the dividing head.

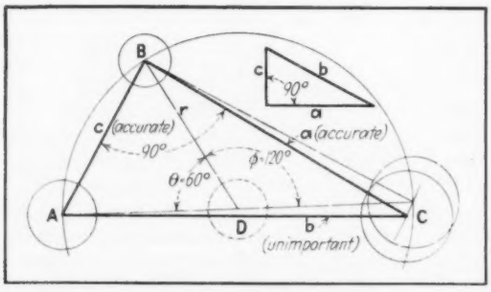


Fig. 1—From cented D, a radius r sweeps through hole centers A, B, and C, and thus they can be located and drilled by indexing the dividing head

With the work clamped on the faceplate of the dividing head, the hole *A* was drilled. Indexing the dividing head 60 deg., the hole *B* was drilled. Indexing 120 deg. more, hole *C* was drilled. The same indexing was used for rough and finish boring.

After drilling the holes, they were bored to leave metal for a light finishing cut with a single-point tool that was honed to make a smooth cut.

The general principle is applicable whatever be the angles θ and ϕ, but attempt should always be made to so proportion them that they and the remaining angle will be exact multiples of the smaller angle. The principle is also employable for any number of holes in the same circle or in concentric circles.

Where the holes are located at the angles of a right-angled triangle, as in Fig. 1, the radius of the circumscribed circle needs no determining, for it is always one-half of the longest side of the triangle. However, when the holes are otherwise located, as in the two cases in Fig. 2, the radius *r* and the angles θ and ϕ must be found unless they are given on the drawing.

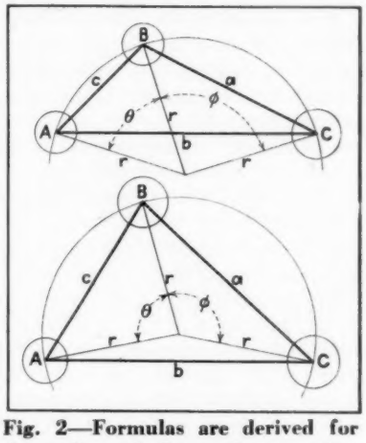


Fig. 2—Formulas are derived for the radius of the angles θ and ϕ when the sides a, b and c are known

The radius *r* is determinable by the formula:

$$r=\frac{abc}{4\Delta}$$

where Δ is the area of the triangle *abc*, and

$$\Delta=\sqrt{s\ (s-a)\ \ (s-b)\ \ (s-c)}$$

in which *s* is one-half the sum of the sides *a*, *b*, *c*.

The angle θ is determinable by the formula:

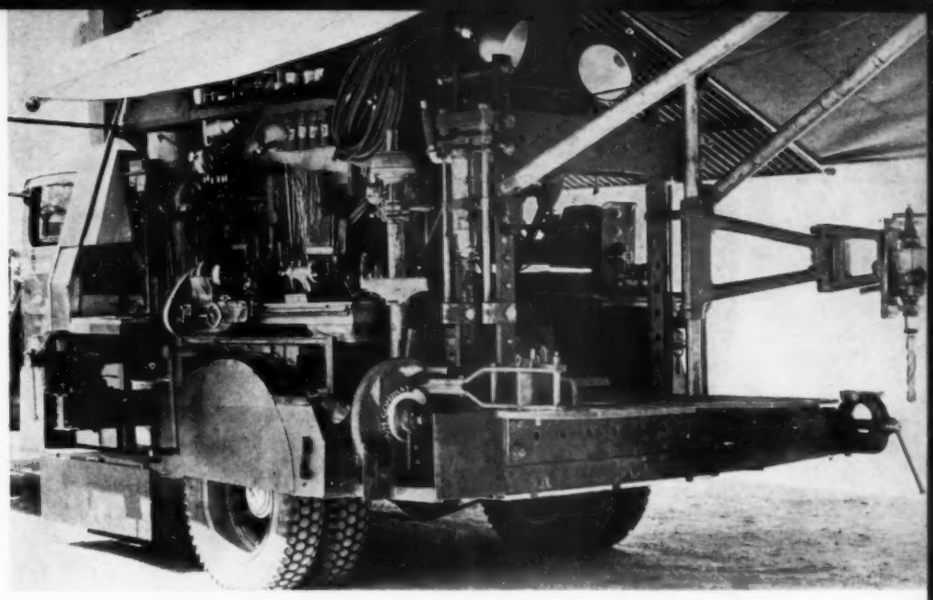
$$\sin\frac{1}{2}\theta=\frac{c}{2r}$$

The angle ϕ is determinable by the formula:

$$\sin\frac{1}{2}\phi=\frac{a}{2r}$$

If angles *a*, *b* and *c* are all invariable, there is no alternative than to accept the angles as evaluated and to try to find a common factor so accurate that the error may be neglected. The same factor should also be a factor of 360 degrees.

Open-Air Shop



Almost any repair job can be done in the field when ingenious mechanics man this welder-machine shop cruiser

TIME, money and, perhaps, lives can be saved in this era of motorization by having the shop follow the work. Thus, we find that a complete and mobile welding-machine shop for the roughest service has been designed by the Couse Laboratories, Inc., Taos, New Mexico. K. W. Couse is the proprietor.

This equipment is quite different from the traveling machine shop so often put together by mechanics with itching feet. It will do maintenance work on trucks, road construction equipment and mining equipment. There is no secret, however, that Mr. Couse's creation will prove mighty handy to field armies for the repair of tanks, aircraft and other paraphernalia of war.

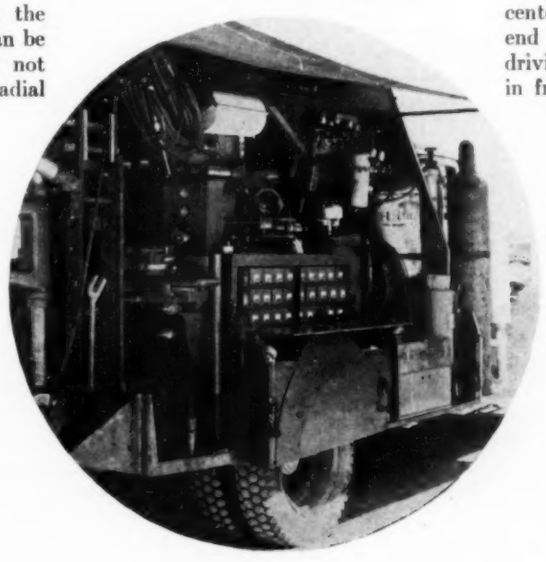
The basis of the outfit is a Diamond-T truck, and the gross weight is 10 tons. Instead of mounting the machines on the truck floor and working inside, the machines face the outside and are worked from the ground. Obviously, large work can be handled and several men need not get in each other's way. The radial drill swings over the ground and can be backed up by the weight of the crane booms for heavy drilling. Work too large for the welding table is positioned by a 3-ton crane with a reach of 18 ft.

Machine equipment is secondary to welding equipment in this cruiser. The 300-amp. welding generator has a.c. slip rings, and thus can be used for flood lighting and for motor operation. The generator is driven by the truck motor through an auxiliary transmission. Reels carry 200 ft. each of welding, ground, and a.c. power cables. Cylinder gas for welding is also carried, in addition to 600 lb. of electrodes and a stock of welding wire.

An ideal place for welding, straightening, hammering, chipping with air hammers and setting up work for drilling or surface grinding is found at the rear of the truck. A ¾-in. plate is set 32 in. from the ground. At the left is a bar bender, and at the right is a 7-in. forged-steel vise. Another vise for filing and general machinist's work is placed at the left center on channels, and it slides out to any position convenient to lathe and forge.

For Heavy Press Fits

The hydraulic press will pull 80 tons or push 125 tons, and can be used as a gear puller. The frame is made of heat-treated chrome-molybdenum steel. Up to 2-in. pipe is taken by the threader, while air drills provide for tapping up to 1 in. These drills or an 8-in. surface grinder can be mounted in a radial arm as shown in the photograph above.



Another example of adaptability is the milling machine. The table and vertical slide are built into the truck but the head is bolted to the slide as an independent unit. It is an automotive boring bar, but will do all ordinary milling work. The combination also making a small horizontal boring machine. With a Precision universal tool head, connecting rods can be bored and faced in one operation. The bar can be taken out for boring cylinder blocks.

There are banks of drawers for bolts, nuts and lockwashers and other drawers contain all types of automotive fittings. An 18-in. grinding wheel runs on ball bearings built into the truck body. On the right side is a metal spray gun for building up worn surfaces. Moreover, there is supplied a sandblast machine of sufficient capacity for general machine work. A new-type air compressor consists of a Model "B" Ford four-cylinder engine with a special head that makes air-compression cylinders out of the two center cylinders and leaves the two end cylinders unchanged to do the driving. The compressor is mounted in front of the truck radiator.

Metal sides of the cruiser fold up and prevent theft of tools. When up they provide shelter from sun and rain, in combination with the large canvas awning. Side curtains make a complete tent when required. Sleeping quarters are located in the body just back of the cab. Two welder-machinists form the basic crew, one working while the other rests. Only 10 min. are needed to set up on the job.

Four-Cavity Die
for Die-Cast Door Knobs

Ingenious application of cores and ejectors assures positive operation and clean castings

E. STEVAN
Wolverhampton, England

DIE-CASTING DIES must be designed with a view to the quantities to be made, so that the requisite number of matrices may be cut in them. Consideration must, however, be given to the capacity of the die-casting machine, and calculations must be made to insure that the weight of metal in the castings, gates, sprues and vents is well below the cylinder capacity of the machine. Sufficient molten metal must remain in the pressure chamber after filling the die to obtain that extra compression which insures homogeneous castings. If all the metal in the pressure chamber is used up in filling the die, the plunger will be at the bottom of its stroke and can go on farther in the effort to compress the metal.

The die illustrated is for casting door knobs such as shown in Fig. 1, and has matrices for casting four knobs at once. Since the knobs are mainly spherical in shape, the die parting line is across the widest section, further joint lines being where the core for reducing weight meets the outer form.

The sectional view in Fig. 2 shows in detail the construction of the die at one of the four casting points. It indicates the method of retaining the core that forms the square hole for the spindle of the lock, also the sleeve ejector for stripping the casting and lifting it clear of the die. A side elevation of the die is shown in Fig. 4, assembled in casting position, but without the side cores for forming the screw holes in the shanks of the knobs. It will be noted that the die is in itself a complete unit ready to be attached to the casting machine and is composed of three main parts: The ejector die *A*, shown also in Fig. 3; the cover die *B*, both of a good quality of steel; and the cast-iron die base or cradle.

A machined recess and a spherical seating on the back of the cover plate align it upon the stationary furnace platen of the casting machine, making close contact between the die and the nozzle of the pressure chamber. Dowels in bushed holes at each corner of the die further align the two die plates correctly. The die base is attached by its flanges to the rear platen on the machine carriage.

Referring to Fig. 2 it will be seen that the lightening core *C* of each impression conforms inside to the tapered shank of the work and meets the body at *Y-Y*, Fig. 1, and is retained in the ejector die by two screws. The core *D* which forms the square hole for the spindle, extends back from the die plate and is held to the bridge piece *F*. This bridge piece is itself attached to the die plate by screws, and is held at the correct distance by the tubular distance pieces *H*. Surrounding the cylindrical shank of core *D* is the sleeve ejector *I*, which at its backward setting forms the base of the knob skirt and is retained by screws in the ejector carrying plate *K* shown in casting position.

To allow sufficient room for the ejector gear to function, it may be seen from Fig. 4 that the ejector carrying plate *K* must be attached to the lower plate *L*, which is operated by racks and a pinion, and the distance required is assured by the tubular distance pieces surrounding the clamping screws *M*. Thus, when a cast has been made and the die is opened, the cores *D* and the bridges *F* stay rigid, while the ejectors *I* and the plates *K* and *L* are advanced to strip the finished castings from the cores and the die. Other ejectors *N*

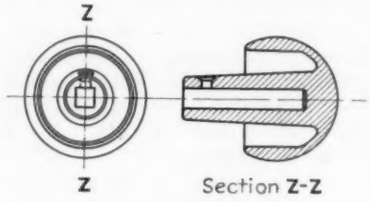


Fig. 1—Cores are required for lightening the head of the knob, for the square spindle hole and for the shank screw hole

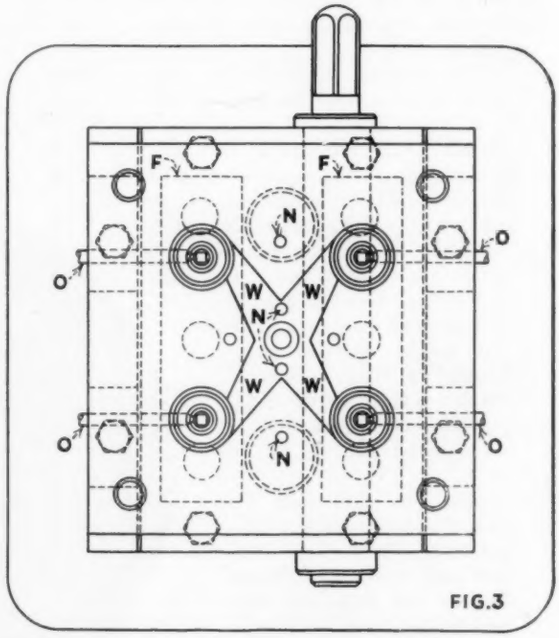


FIG.3

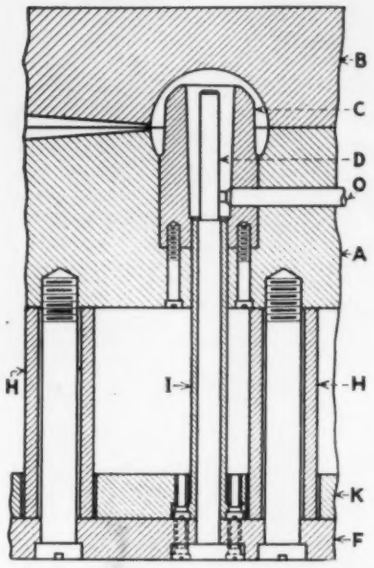


Fig. 2—Sectional view of the die at any casting position

(Fig. 3), spaced about the sprue pin for removing the sprues, are safety appliances for insuring that the ejector mechanism will return to the starting position as the die closes. These ejectors are required especially if the gearing is dispensed with and automatic ejection is made through fixed rods striking the ejector plate.

For operating the cores *O*, which form the screw holes in the knob shank, the inclined plane principle shown in Fig. 6 is employed. Blocks *P* and *S*, coinciding in width to the die plates to which they are attached, are fitted to both sides of the die. Cores *O* are held in blocks *S* by special screws. Blocks *P* are firmly attached to the cover die, while blocks *S* are free to rise from their seats and are guided vertically by pillars *T*. Arms *V* at each end of the die fit into grooves machined across the ends of the blocks, being securely attached to blocks *P*, yet being a good sliding fit in blocks *S*. As the die is opened, arms *V* cause blocks *S* to rise from the die plate and are guided by pillars *T*, thus carrying the cores away from the castings.

When the die is in casting position, molten metal is admitted to it by the tapered sprue opening and is deflected by the central sprue pin or spreader along the gates *W* to the impressions. Since the cover die is constantly in contact with the container nozzle and becomes excessively hot by the rapidity of operation necessary for economical production, some method of cooling must be provided. The way the plates are drilled through and fitted with copper tubes *Z* for the supply of cooling water is shown in Fig. 5. In most cases, the sprue pin is also designed for water cooling, and in this and the drilling of the ejector die for water tubes, much ingenuity has to be exercised to avoid too many holes through the die and to cool the necessary areas. Venting the die, enabling air to be exhausted instead of being trapped in the castings, is done by grinding shallow grooves across the die after taking a low-pressure cast, by which the best points to vent in view of the resultant flow of the metal have been determined.

After casting and breaking off the pieces from the sprues, a light trimming operation only is necessary before passing the work to the finishing department.

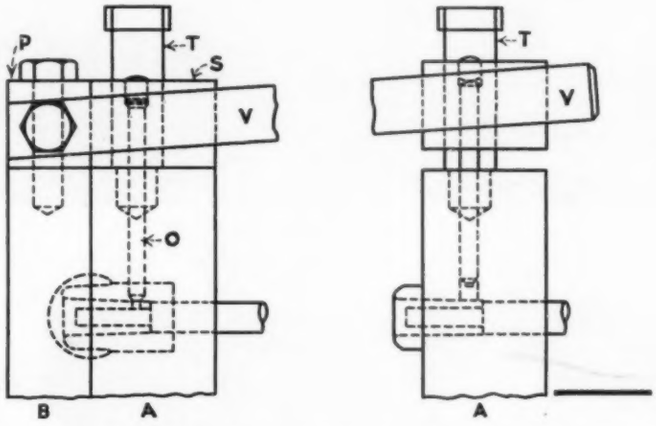
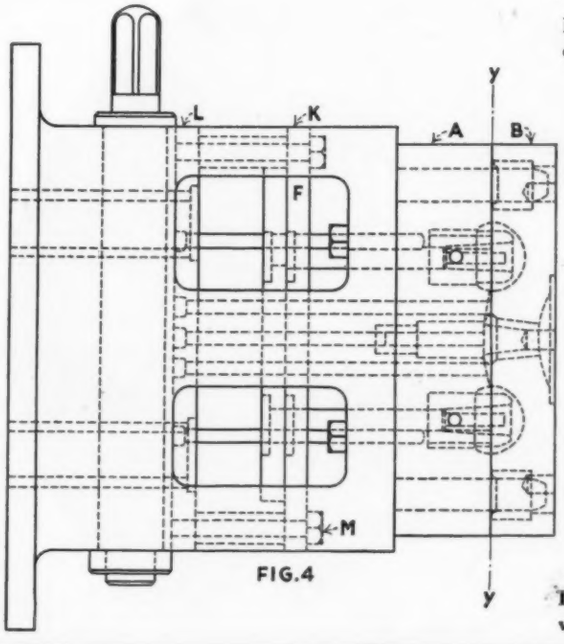


Fig. 6—This mechanism is fitted to the side of the die for operating the cross cores for the screw holes



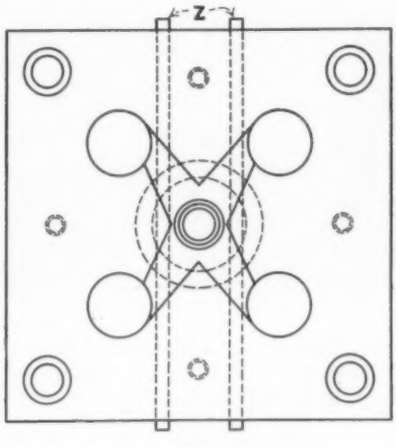
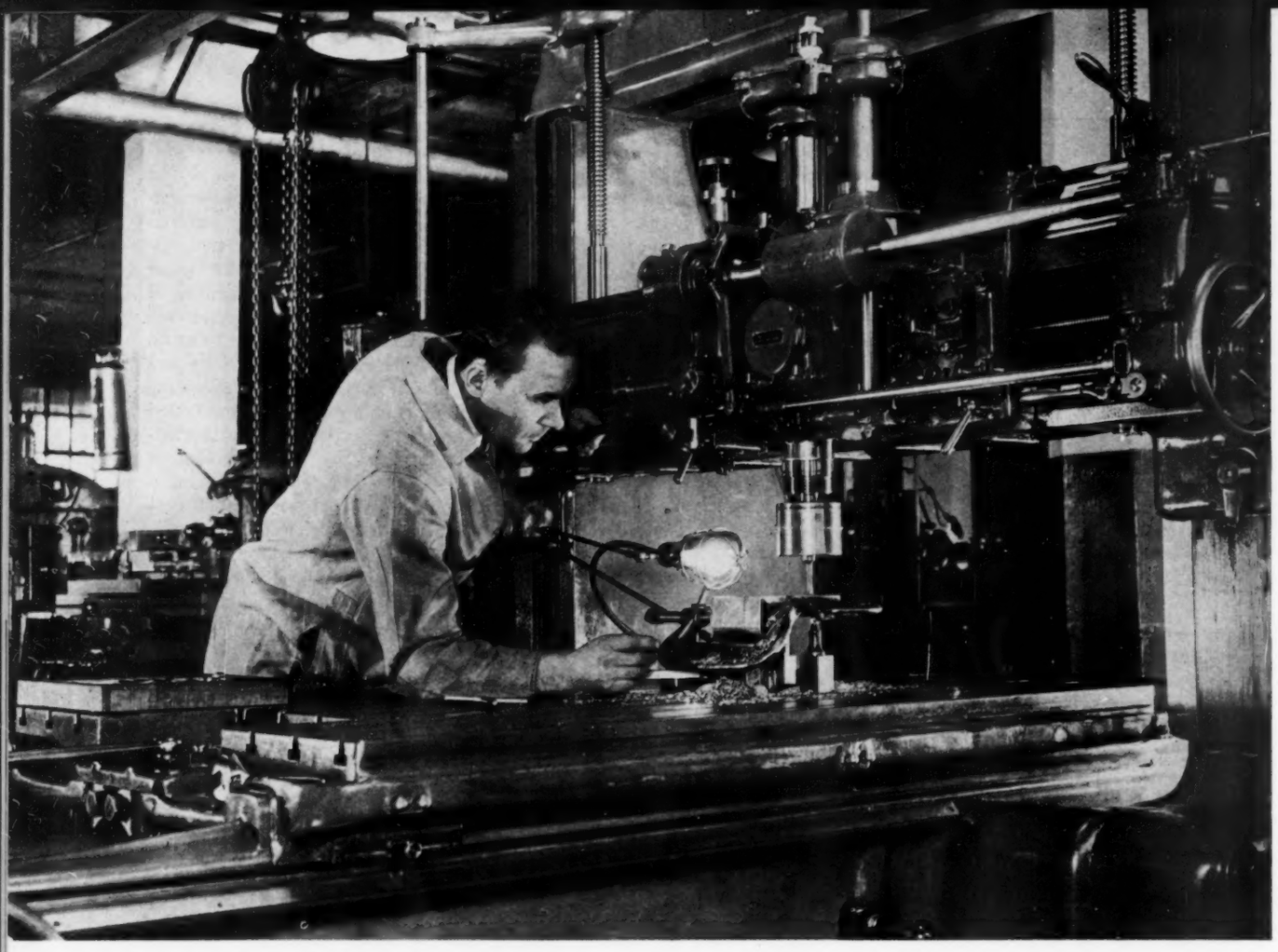
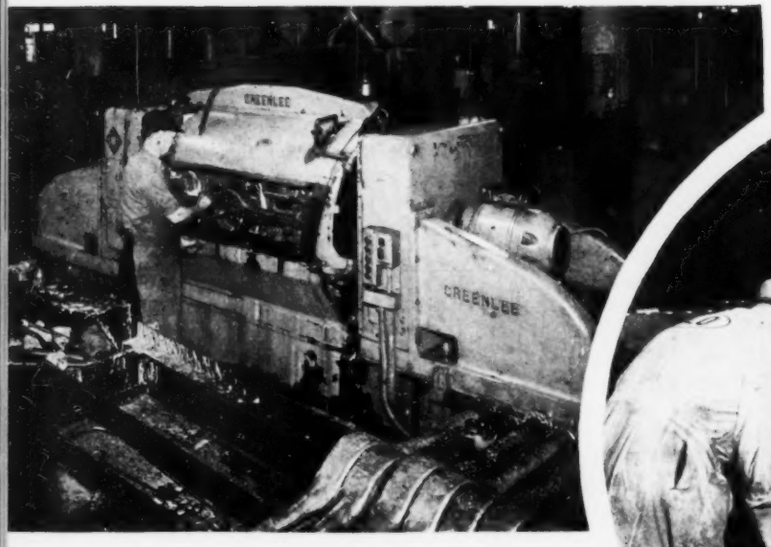


Fig. 3—Plan view of die. Fig. 4—Side elevation. Fig. 5—Cover die in open position



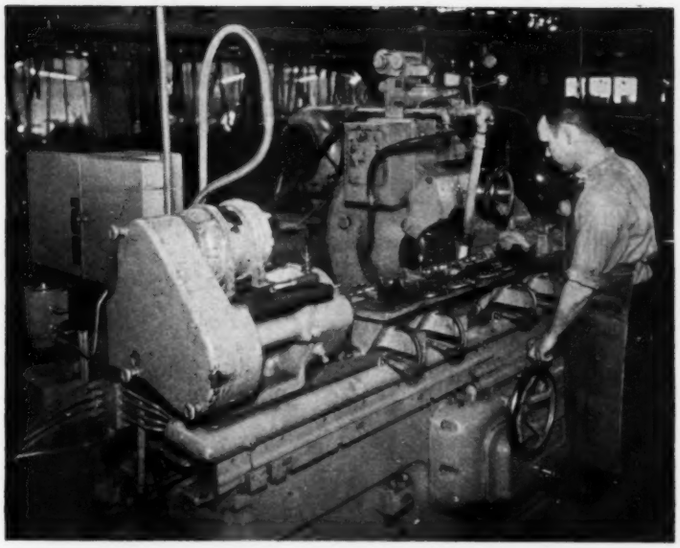
This Swiss jig borer is used on jigs, fixtures and dies in Buick's tool room

Modernization

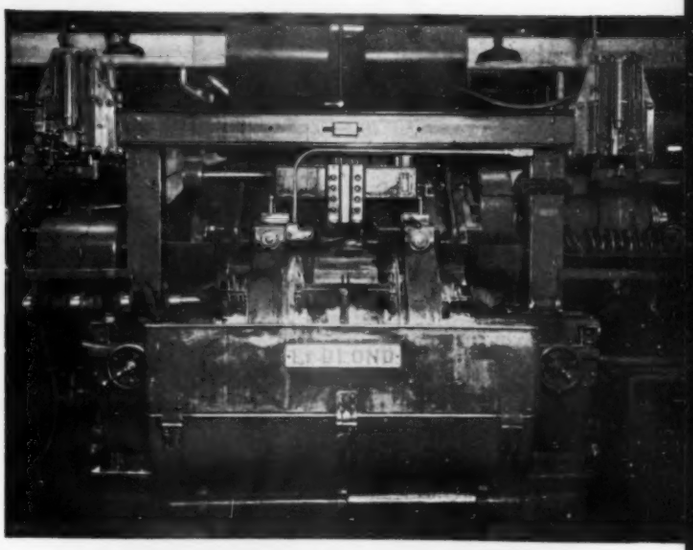


Ends of rear axle housings are machined on a special Greenlee horizontal machine

All eight cylinders in the Buick block are bored simultaneously on the Ex-Cell-O machine



Main bearings on the camshaft are ground on a Landis hydraulic grinder



ALTHOUGH the Buick Motor Company spent over thirty million dollars for plant expansion and modernization at Flint, Mich., in two years, its purchases for improvement of manufacturing processes never cease. Its capital outlays for new equipment this year will be great. On these two pages the reader will find some examples of new machines recently installed by Buick which contribute to lower production costs and improved quality of product.

Never Ends at **Buick**

Finish turning main bearings on crankshafts is done on a LeBlond crankshaft lathe

Shifter fork in transmission is broached on Cincinnati vertical hydraulic broaching machine

Machining the differential side gears on a No. 9 Gleason machine

Ductility of 86 per cent elongation in the outer fibers is shown by this free-bend test of shielded-arc weld metal in high tensile steel

Much weight is saved in railroad cars by making the center sills of high-tensile material

Newer Steels *Save Weight*

These low-alloy materials have greater strength than carbon steels, but are welded by much the same procedure

GEORGE LANDIS
Chief Engineer,
The Lincoln Electric Company

CONSIDERABLE interest has been aroused in low-alloy, high-tensile steels by their use in high-speed trains, ships, trucks and cranes. Such steels are important because they permit reduced weight while providing high structural strength. Advantages of this low ratio of weight to strength are apparent in saving power, wear on equipment and space.

Low-alloy, high-tensile steels are made in a number of alloys by the various manufacturers. Analyses and physical properties of typical trade-named materials are given in the accompanying table. These steels are readily welded with the proper shielded-arc electrode and procedure, generally the same as for welding plain carbon steels. Welds are commonly produced with the following physical properties: tensile strength of 100,000 lb. per sq. in.; ductility of 20 per cent elongation in 2 in.; and impact resistance of 45,000 lb. per sq. in. The free-bend test indicates the high-quality results obtained.

Compositions and Physical Properties of Typical Low-Alloy High-Tensile Steels

Name of Steel	*Carbon*	*Chromium*	*Manganese*	*Silicon*	*Phosphorus*	*Copper*	*Nickel*	*Molybdenum*	*Yield Point Lb./Sq. In.*	*Ten. Strength Lb./Sq. In.*	*Ductility: Per Cent Elongation in 2 In.*
Corten	0.10	0.50–1.50	0.10–0.30	0.50–1.00	0.05	0.30–0.50	.....	.....	50,000–60,000	65,000–75,000	22–27
Cromansil	0.15	0.50	1.25	0.75	.....	.....	.....	.....	60,000	95,000	24
Manten	0.35	.....	1.25–1.70	0.15 min.	0.05	0.20 min.	.....	.....	55,000–65,000	80,000–90,000	20–25
R. D. S.	0.08–0.23	.....	0.70–0.75	.....	.....	1.30–1.40	0.75	0.11–0.16	65,000–70,000	74,000–90,000	20–50
Silten	0.40	.....	0.70–0.90	0.20–0.30	0.05	.....	.....	.....	45,000	80,000–90,000	18–23
Yoloy	0.08–0.20	.....	0.40–0.65	.....	.....	1.00	2.00	.....	58,000–73,000	74,000–92,000	29–34

Ideas from Practical Men

Milling Fixture With Rapid Wedge Clamp

A. C. GODDARD
Chief Tool Designer
The Cleveland Tractor Company

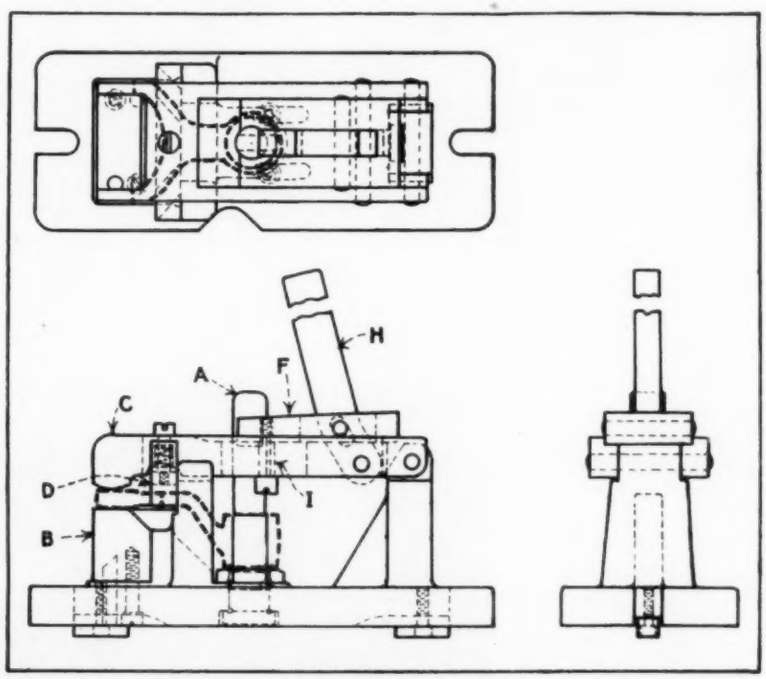
Application of eccentric, cam, or toggle clamps to milling fixtures presents difficulties, since each has a critical locking point. A cam having a constant rise often requires a great enough periphery to give the rise required for variable locking positions; consequently it cannot always be applied in a limited space. The wedge clamp herein described has a surface contact when locked, as compared to the line contact of a cam. It provides complete clearance for loading the work and requires but one motion to bring it into position and lock it.

In the fixture illustrated, the work to be held is a gear-shift fork. It is located on the post *A* by a reamed hole, and on the rest block *B* by a machined surface. The clamp *C* is pivoted to an upright on the base and carries the spring V-block *D* which serves to locate the work radially. It also carries the sliding wedge *F* and the lever *H*. The wedge has a limited movement controlled by shoulder screws *I* through elongated holes in the clamp. The post has angular flats milled on opposite sides to admit the wedge, which is slotted to straddle the post at that point. The lever is pivoted to the clamp and acts on the wedge by means of the pivot pin.

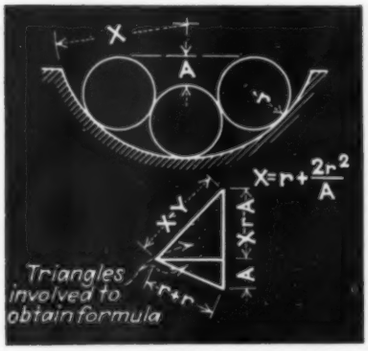
To clamp the work, the lever is moved forward, bringing down the clamp. Further forward movement of the lever engages the wedge in the angular flats on the post and pushes it along until the work is clamped.

To release the clamp, the lever is pulled backward, completely disengaging the wedge from the post, at which position it picks up the clamp. Further backward movement of the lever causes the clamp to be lifted from the work and carries it to the extreme open position. The work can then be loaded or unloaded.

Since milling is generally the primary operation on work that is required to be located and clamped on variable rough surfaces, the wedge clamp, due to surface contact, can have nearly double the rise of a cam for the same purpose. It therefore lends itself to the above condition.



After the fixture has been loaded, the clamp is brought into position and clamps the work by a sliding wedge with but one motion of a lever



By using three rollers of the same diameter and finding dimension A, the radius of the bore can be accurately determined by the formu a

Finding the Diameter Without the Center

GEORGE L. GARVIN

The method of finding the diameter of a bore where the center is not available given on page 1012 of the *American Machinists' Handbook* (5th Edition) is suitable for rough work only. Obviously it cannot be applied to a job that must be extremely accurate for various reasons. Some of these are: The segment of the bore of which the diameter is to be found may have rounded edges;

lack of measuring tools having needle points to obtain the distance from the wall of the bore to the scale; and the difficulty of placing the scale graduations directly on the curved surface of the bore.

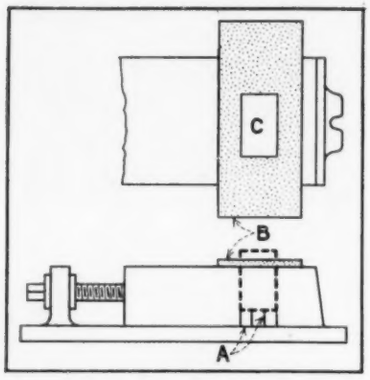
The method herein described is useful in diemaking, patternmaking and toolmaking and its accuracy can be depended upon. Three rollers of the same diameter are placed in the segment of the bore, as shown in the illustration. The only operation needed is to measure dimension *A* with a depth micrometer or to place a straight-edge on the two outer rollers and find dimension *A* with an inside micrometer or with gage blocks. Having found dimension *A*, it is necessary only to use the formula given in the illustration and solve for *X*, which is one-half the wanted diameter.

Chip Protector for the Machine Vise

F. MUIR
Hamilton, Ontario, Canada

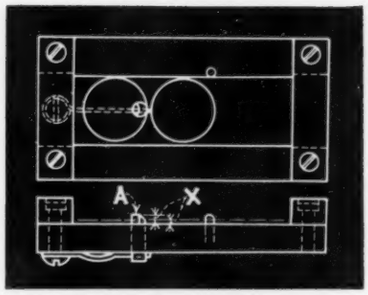
When work held in a machine vise is blocked up with parallels, as at *A*, chips are sure to get in between the jaws and on the parallels, so that much time is lost in cleaning them out after each piece has been machined and before another piece can be properly seated.

To eliminate the necessity for cleaning out the chips, I cut an open-



Vise and parallels are protected from chips by a piece of felt or leather having an opening to fit the work

ing in a piece of felt or leather *B*, as at *C*, to fit snugly over the work and keep out the chips. When the piece is finished, I lift out the work and the cover together, pull the cover off of the work and tap it to knock off the chips, replacing it on the next piece. In this way I avoid the necessity for removing the parallels and cleaning them each time a finished piece is removed.



This simple automatic stop is so dependable in operation that the press can be run continuously until the strip stock is used up

Automatic Stop for Press Tools

R. H. HANDLEY

The type of automatic trigger stop commonly used in simple dies cannot be used in compound dies without some change in design to permit it to be mounted on the under side of the stripper.

When such a stop is properly made it will operate very nicely, but the stop shown at *A* in the illustration is simpler and cheaper to make. It occupies but little space and is so dependable in operation that the press can be run continuously until the strip stock has been used up.

No great accuracy is required in making the stop. The illustration shows the general idea so well that the stop can be made to suit the job. The dimensions *X-X* are approximately equal to the thickness of the stock.

Magnet Collects Filings From File and Work

GEORGE J. MURDOCK

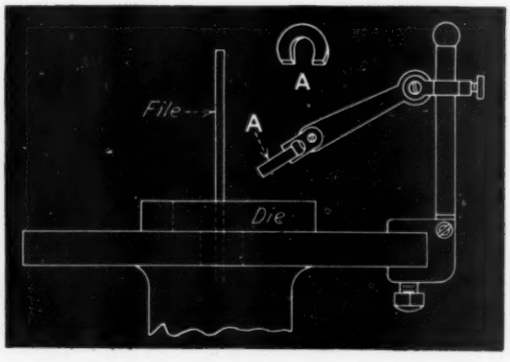
Much difficulty is encountered in filing to lines in a filing machine because of the filings that are drawn up on the back stroke of the file settling on the work and obscuring the lines and causing lost time in brushing them away.

But there is now on the market a little permanent magnet, which if properly applied, will collect the filings and prevent them from settling on the face of the work. Made from an alloy of aluminum, cobalt, nickel and iron, this little magnet is about the size of a 50-cent piece, but is so powerful that it will lift 50 times its own weight, which with its keeper is less than 2 oz. Having such a tremendous attractive pull, it quickly collects all filings within a radius of 3 in.

With the magnet in use, less pressure of the file on the work is required, because the filings that would otherwise cling to the file are attracted to it, thus keeping the file clean.

The illustration shows the magnet *A* held by the adjustable arm of a clamp attached to the edge of the machine table. In filing a die of medium size it is not necessary to clean the magnet of filings until the work has been finished. It is easily cleaned with a fine brass wire brush without removing it from its place. The magnet will hold its power indefinitely if the keeper is kept on the poles when not in use.

Besides its use on the filing machine, the magnet will be found useful for other purposes, such as fishing small parts out of the quenching tank, preventing steel balls from rolling away when assembling ball bearings, and removing steel particles from the eyes.



Held by an adjustable clamp attached to the filing machine table the magnet will attract the filings and prevent them from collecting on the work and obscuring the lines

Kinks Did It—Why?

FRANCIS W. SHAW
Broadly, Lancashire, England

Referring to the article under the above title by George J. Murdock (*AM*—Vol. 80, page 893), before accepting the verdict that kinks did the trick, I should like to be satisfied that a kinkless bar would not have had a like effect. A twenty-minute rain of blows—say, 1,500—not quite so springy, might easily have a repetitive effect great enough to overcome the friction, for, repeated often

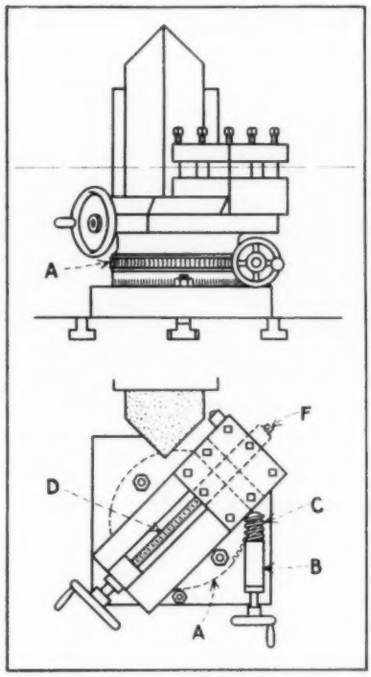
enough, the lightest blow would overcome almost infinite resistance—millions and millions and millions of blows, of course.

Yet there may be something in the kink theory. Though somewhat reduced in its direct effect, the time of action of each blow is lengthened and therefore the energy is expended more in tending to force out the arbor than in the useless compression of the material of the bar, and the equally useless attempt to move the machine.

Swivel Fixture Dresses Both Sides of Wheel

R. G. HEWITT
Huddersfield, Yorkshire, England

The device described by J. R. Whittles in an article under the above title (*AM*—Vol. 80, page 967) calls to mind the attachment illustrated, which is used for the same purpose.



Made from the compound rest of an old lathe, this fixture can be used to dress abrasive wheels to various angles and arcs, either convex or concave

It was made from the compound rest of an old lathe. To increase its utility, worm teeth were cut in the circular part *A*, and the bracket *B* to carry the worm *C* was added.

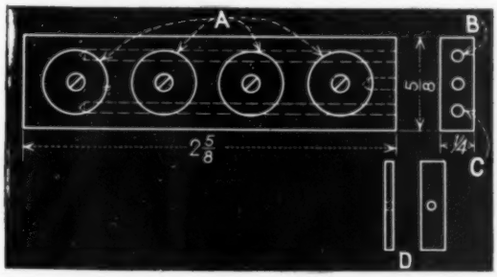
To dress one side of the wheel at an angle, the diamond is held in one side of the clamp and the fixture is swiveled to the desired angle as indicated by graduations on the base. The diamond is traversed by the screw *D*, the depth of cut being controlled by the cross-feed of the machine. For dressing the other side of the wheel, the diamond is held in the opposite side of the clamp and the fixture is swiveled to the required angle on the opposite side of zero.

To dress the wheel in concave or convex arcs, the diamond is held in the center of the clamp, as at *F*, and the pivotal point of the fixture is set in line with the center of the wheel face. The toolblock is set so that point of the diamond is at the desired radius from either the front or the back of the pivotal point, according to whether the arc is to be convex or concave. The fixture is then swiveled by the worm gearing, causing the diamond to describe an arc.

Holder for Toolmakers' Buttons

GEORGE DESCHENES

Since a tap drill and a tap must be used in connection with attaching toolmakers' buttons to the work, they should all be kept together.



Besides holding the buttons, longitudinal holes form receptacles for the tap drill and the tap

The holder illustrated is made of machine steel. Four buttons *A* are screwed into tapped holes in the outside. Longitudinal holes *B* and *C* are receptacles for the drill and the tap. The cover *D* is made of thin stock and is attached to the end of the holder by a knurled-head screw and retains the drill and the tap.

The copper bit of a soldering iron is connected to the handle by pieces of pipe having a coupling or an angular pipe-fitting between them

Soldering Tools for Metal-Pattern Making

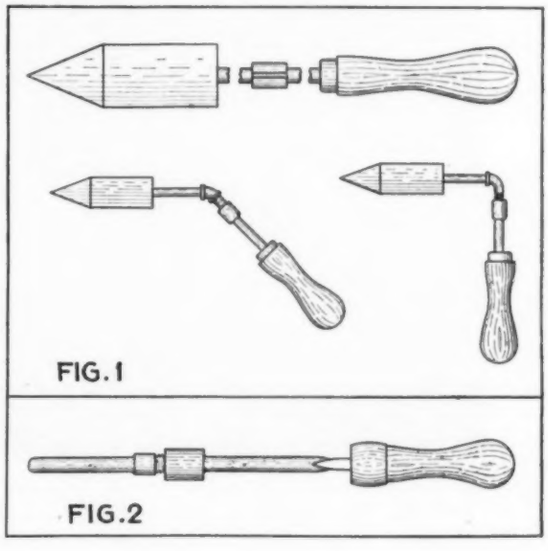
C. F. FITZ

In making metal patterns largely built up from bar and sheet stock, it was necessary to have a soldering tool that can be used in a number of different positions. To meet this need, the soldering tool shown in Fig. 1 was made.

A piece of 1-in. square copper is pointed at one end and the opposite end is drilled and tapped for ⅛-in. pipe. Two short pieces of pipe with a coupling between them connect the copper bit to the handle, making a straight-handled tool. To have the copper bit at different angles to the handle, the coupling can be replaced by elbows of either 45 or 90 deg., as shown.

Another useful implement is the tool in Fig. 2. It is used for flowing solder into square corners for forming fillets. The tool is made from bar copper and the inner end is threaded to fit the holder, the outer end being rounded to the desired radius. Interchangeable copper bits can be made in sets for fillets of different sizes. Solder is applied to the corners, and the tool flows the solder to the desired radius on the work. For very large fillets, the outer end of one of the copper balls of various diameters can be screwed on it.

Like the soldering tool, the copper bits for the filleting tool can be connected to the handle by pieces of pipe having a coupling or an angular



fitting placed at convenient points between them.

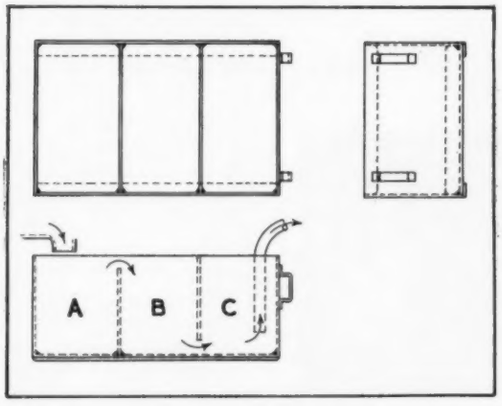
Both the soldering and the filleting tools can be screwed into the handle of an electric soldering iron.

Settling Tank for the Grinder

J. R. WHITTLES

A settling tank for the grinder that separates the chips and grit from the grinding compound is illustrated herewith. It is made of sheet iron welded together and has two handles in front for sliding it in or out of the machine base. The bottom has two steel strips for it to rest on and to take the wear when sliding it in or out.

Compartment *A* receives the compound as it returns from the work. The chips and grit, being heavier than the compound, settle to the bottom. When the compartment is full, the compound will flow over the top of the first baffle plate and into compartment *B*. The foam that is formed will rise to the top, while the clean compound will flow under the second baffle plate and into compartment *C*, from where it is drawn through the suction hose to the circulating pump and is forced through the delivery pipe to the wheel and to the work.



Flowing over and under the baffle plates, the lubricant is freed from chips and grit by the time it reaches the last compartment

Cutting Bolt Ends Flush With Nuts

CHARLES C. TOMNEY
Chief Tool Designer, Carrier Corporation

On our condensers the flanges vary in thickness and it is impracticable to use bolts of different lengths to match the thickness of the flanges at various points. The condensers are placed in the holds of ships, and if the threaded ends of the bolts are left protruding from the nuts they rust and are hard to remove.

Cutting off the ends of protruding bolts with a hacksaw is a costly and tedious job, so we made the hollow mill illustrated and use it in a portable electric drill. One man guides the drill while another one presses down on it, using a piece of 2x4-in. scantling as a lever. In a short time the hollow mill cuts a bolt flush with the nut, leaving a small tit at *A*, which is cut off with a cold chisel.

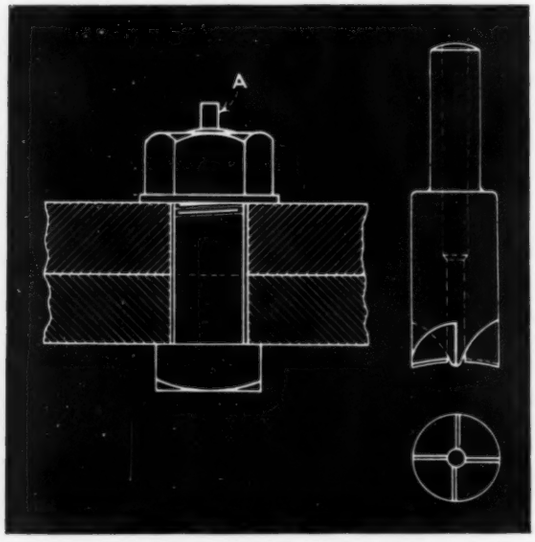
It will be seen that the cutting edges of the hollow mill are concave so they will leave the bolt ends slightly rounded. Also that an axial hole is drilled through the hollow mill so that if any of the tits should break off, they can be easily driven out.

All Welded Adjustable Knurling Tool

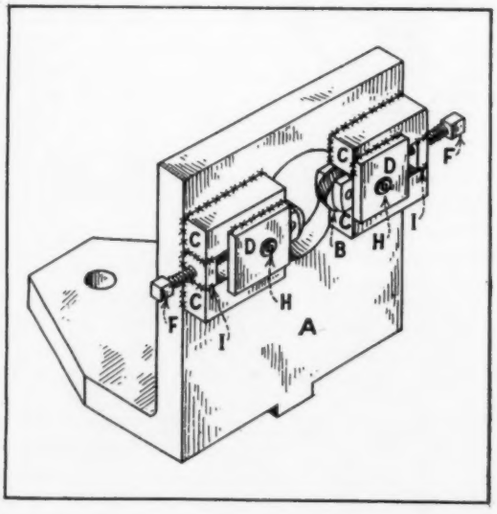
RALPH J. THOMPSON

The knurling tool shown is quickly adjustable over a wide range. The angle-iron base was designed for mounting the tool on a flat-turret lathe. Mounted on a plate or a shank, the tool could be used on any other type of turret lathe. If it is desired to leave any part of the work unknurled, a toggle arrangement could be added to open and close the knurls simultaneously. This device can be used on tool handles and inserts for die-castings.

The base *A* is heavy structural angle iron having the bottom cut away to leave an integral tongue to fit the T-slots in the turret. Knurl holders *B* are pieces of ¾-in. square tool steel milled out to receive the knurls and fitted with pivot pins. The holders slide in housings formed by the pieces *C* and are confined therein by the cover plates *D*. They are adjusted and backed up by the setscrews *F* and are locked in position by the hollow-head screws *H*. The setscrews *F* screw through nuts *I* which have been ground down to fit between the housings. All the stationary parts are assembled by welding.



Protruding ends of bolts that are likely to rust so that the nuts cannot be unscrewed are cut down flush by a hollow mill held in an electric drill

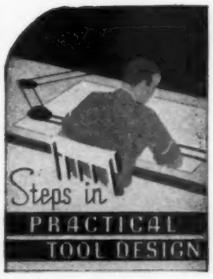


By using stock sizes of material, very little machine work is required in building this knurling tool. All the stationary parts are assembled by welding. The tool is used on the turret lathe

Drilling Jigs

Can Be Designed in

Wide Variety



VII—Six distinct types are described as the start of an extensive discussion of drilling jigs, their components and accessories

C. W. HINMAN

OUTSTANDING types of drilling jigs are: plate, channel, channel and leaf, box, box and leaf, angular stand, built-up jigs, and the recessed types. The latter consists of several sub-varieties, namely: the V-block or its equivalent, the block and hole types, and those extraordinary designs in which the work is maneuvered into place against the stops and locked in position with screws, keys, clamps or cams.

Many other types are variations of channel and box jigs. These are used in connection with vertical-spindle multiple drilling machines. Machines with 6 to 36 spindles, or more, are available for multiple drilling. Other jigs are the "built in types" and are incorporated as an integral part of a special drilling machine. For example: In drilling a sewing-machine head, the jig is bolted on the machine frame. The drills revolve in sliding supports and approach and drill the holes through bushing guides. The operations may include drilling from above, from the sides and ends, and sometimes from the bottom. The holes are at right angles and at other angles to the work.

Small jig bodies, up to about 2 in. high, 3 in. wide and 6 in. long, are usually machined from one block of machinery steel, although most designers do not prescribe any particular size limit for this. For larger jigs, channels and other convenient shapes are used to avoid excessive machine work, with ⅛-in. allowance made for machined finishes. Large heavy jig bodies and hinged leaves and covers are designed with the view of making patterns and cast-iron castings. The body parts of very large jigs are sometimes built up with steel angles, or with channels and other structural steel sections, in connection with plates, rods or straps. These members are selected for light weight and great strength, and are fashioned into a presentable design by heating, bending or forging when necessary, and are assembled by welding or with cap-screws or bolts, and the usual dowel pins for rigidity. Such tools are called "built-up" jigs or fixtures.

Plate Drilling Jigs

One type of plate drilling jig is shown in Fig. 41. The plates are cold-rolled steel, and the upper plate is the same thickness as the bushing lengths. Three flat-faced, shouldered stop pins, flats against the work, are drive fits in the bushed plate or body, and easy clearing fits in corresponding holes in the lower plate. The lower plate is extended ½ in. to provide space for clamping it on the drill table if desirable, or to facilitate removing the jig and work after drilling. For holes drilled through the work, the lower plate is provided with clearance holes coincident with the bushing holes. Clearance holes are 10 per cent larger in diameter than the drill and thus cut off some of the burrs caused when the drill breaks through the piece.

This tool appears very simple, but some plate jigs are a problem in design. An example is a large plate containing 125 bushings and used on both sides of the same work. Some of the bushings may be for bottom holes, and some for through holes, and provisions must be made to cover the bushing holes not wanted on either side of the work. This is sometimes attempted by using wax in the unwanted holes, but a better method is to design thin templates that expose the desired holes and which cover the others. It is sometimes a

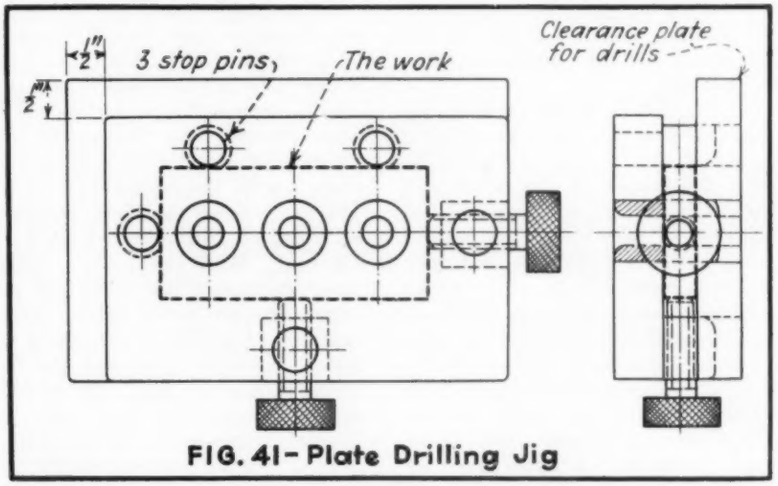


FIG. 41—Plate Drilling Jig

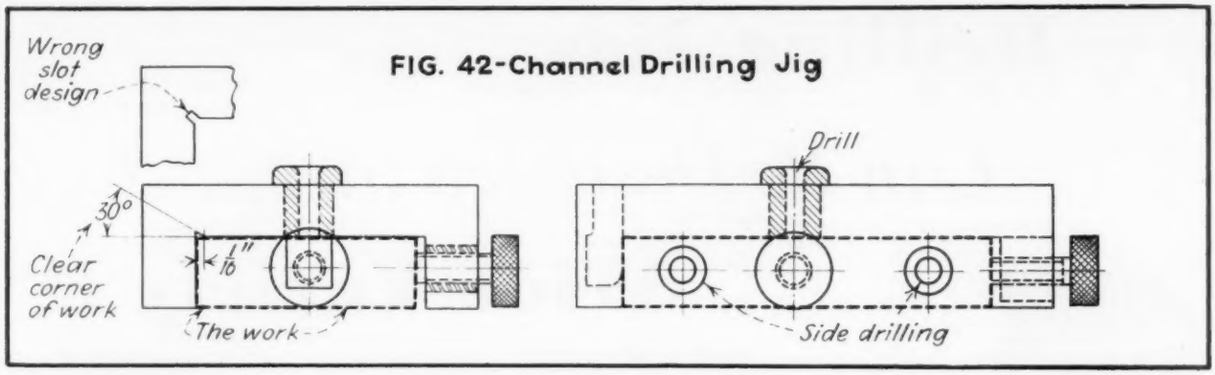


FIG. 42-Channel Drilling Jig

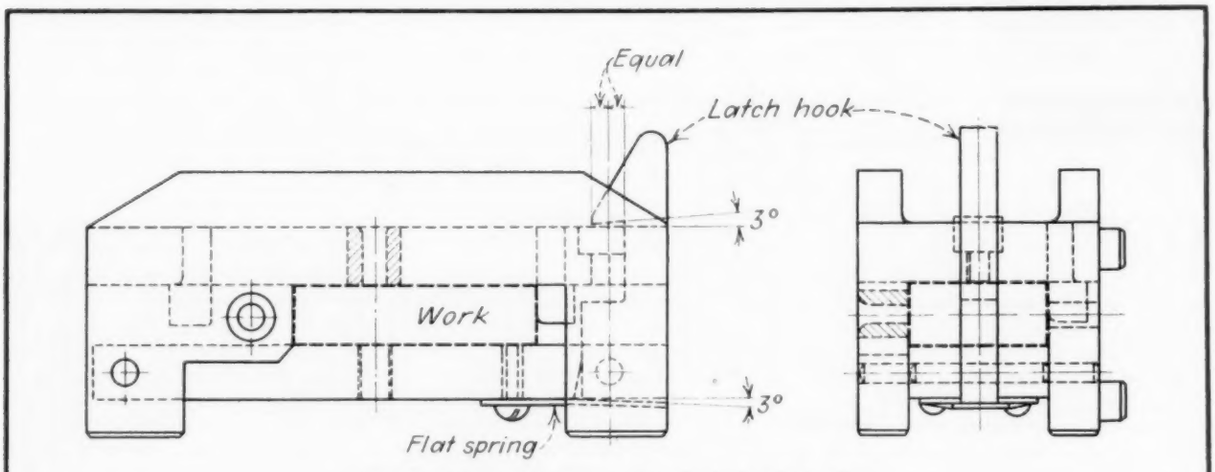


FIG. 43- Channel and Leaf Jig

problem to determine the correct gaging points, whether to extend the same gaging pins through the plate and "bell mouth" the bushings for drilling from opposite sides of the plate, or to reverse the work and gage from the same pins as used in the first operation and take chances of inaccurate drilling when gaging from opposite edges. It is sometimes better to "pin in" from previously drilled holes for drilling the remaining holes, or to make a separate jig plate. It depends on the precision required in the location of holes drilled in the last set up, and the quantity of pieces to be drilled.

In Fig. 42, a simple channel jig shows a good feature. The gaging corner of the channel is relieved to clear the corner of the work and should also be designed to prevent the gathering of chips that might cause a faulty location of the work, bad drilling and rejected parts. The wrong slot design, as shown, lends itself particularly well for wedging in of chips, while the right design is shown below it by the 30 deg. angular relief from which the chips are easily cleaned. The channel is the same depth as the work thickness. Channel jigs are used for small orders, and are inaccurate for side drilling without using great care, unless the channel is made deeper and cross keys or a cover provided to prevent work shifting during the side drilling operations.

Equalized Drilling Load

A better design for the common channel and hinged-leaf jig is presented in Fig. 43. The strengthening ribs are located lengthwise on the top side of the jig body, instead of the usual method of locating them lengthwise below on each side of the work. This feature leaves the work side within the jig free and open, and readily cleared of chips and oil. It is observed that the latch-hook jaw straddles the center line of its fulcrum pin in the hinged leaf below. This is the correct principle, affording an equalized distribution of the drilling load. With the 3 deg. angular jaw, this type of latch-hook will not loosen or shift under heavy drilling pressure. A hardened wear pin is inserted under the jaw, and the flat spring on the leaf under the latch is provided with a 3 deg. angle for latching compression. Hardened wear pins, not shown, can be inserted in

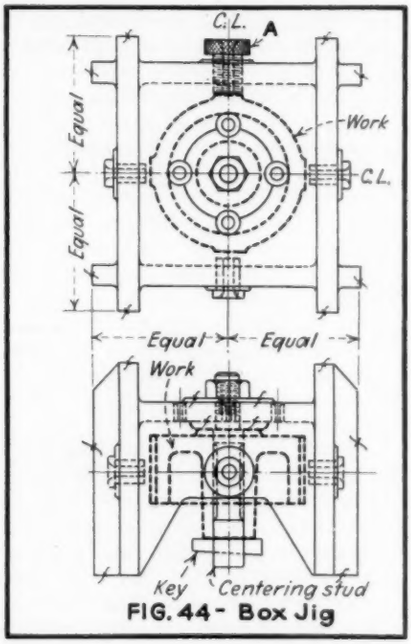


FIG. 44- Box Jig

the feet, or if the body is machinery steel, it can be pack case hardened and then straightened if warped.

A box-type drilling jig is sketched in Fig. 44. This jig has a cast-iron body with a relieved centering stud

on which the work is located from a previously bored center hole. The work is positioned for drilling the eight holes, by the approaching face of screw bushing *A*, and then locked in place with the key shown through the centering stud. Ribs are provided across the jig for clearing the nut that holds the stud. These ribs are necessary when the tool is turned "open side up" for removing the work and in placing another piece for drilling.

In all cast-iron jigs the ribbed feet are designed parallel with the direction in which the pattern is drawn from the foundry mold to avoid making unnecessary core boxes. The sketch shows equal distances from the vertical and horizontal center lines to the surfaces of all the feet. This principle is often employed, especially in small plants where single-spindle drills are used. This idea provides for one drill height adjustment for all sides of the tool, and by using a stop on the down "strike," all the holes are drilled to equal depth, if necessary.

A box jig and leaf is very similar to the design just described except that a hinged leaf or cover is provided in which screws or other fastenings are attached and used for securing the work in an immovable position. Such cases are for pieces which have no previously finished hole for locating on a stud, and when side gaging and side locking devices are necessary.

One type of a large built-up jig is given in Fig. 45. The cover is purposely omitted in the upper view to show the interior construction. This tool is an arc-welded product, and its members are all structural-steel angles, except the braces and cover, which are structural steel plates. Feet are provided and machine finished on six sides of this tool, for squaring, and to make it possible to use the jig on any of its sides. Bolt and nut fastenings, not shown, are used for securing the cover. Angular bushing plates, like those at *A*, can be attached wherever needed. Built-up jigs are designed for drilling large heavy castings, similar to converter bases, and speed reducing units.

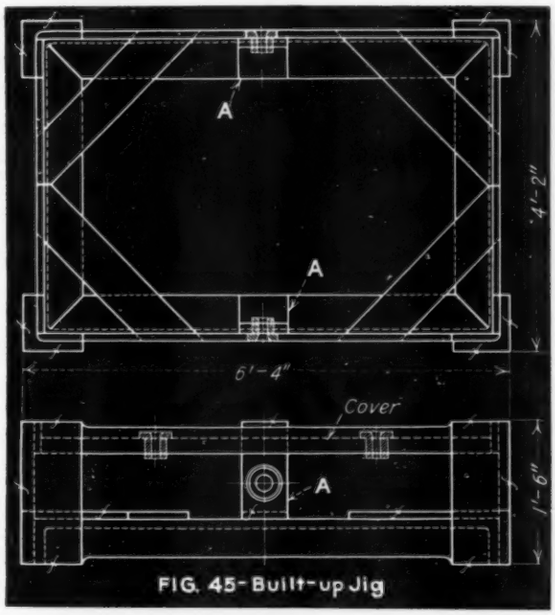


FIG. 45-Built-up Jig

A recessed jig, Fig. 46, holds the work for drilling from several of its sides without using a leaf or cover. The jig and work, in this case, are cast iron. The piece is literally "hooked into the jig" after backing away the locating screws. The fastenings are then tightened, and drilling proceeds. The illustration shows the method of maneuvering the work into place. The finished piece is similarly backed out of the jig. Screw bushing *A* is unusually long. It is therefore relieved half its length as shown. It guides the drill into the work by a length of two of its drill diameters. This is the usual practice, because if the bushing guides are too long it cramps the drill. Recessed jigs are low in cost, and are used for drilling small orders. Their fault is the time lost in handling the work. For large production a box and latch-hook jig would be more suitable for speed.

Part VIII of C. W. Hinman's series will discuss additional types of drill jigs and will appear in an early number.

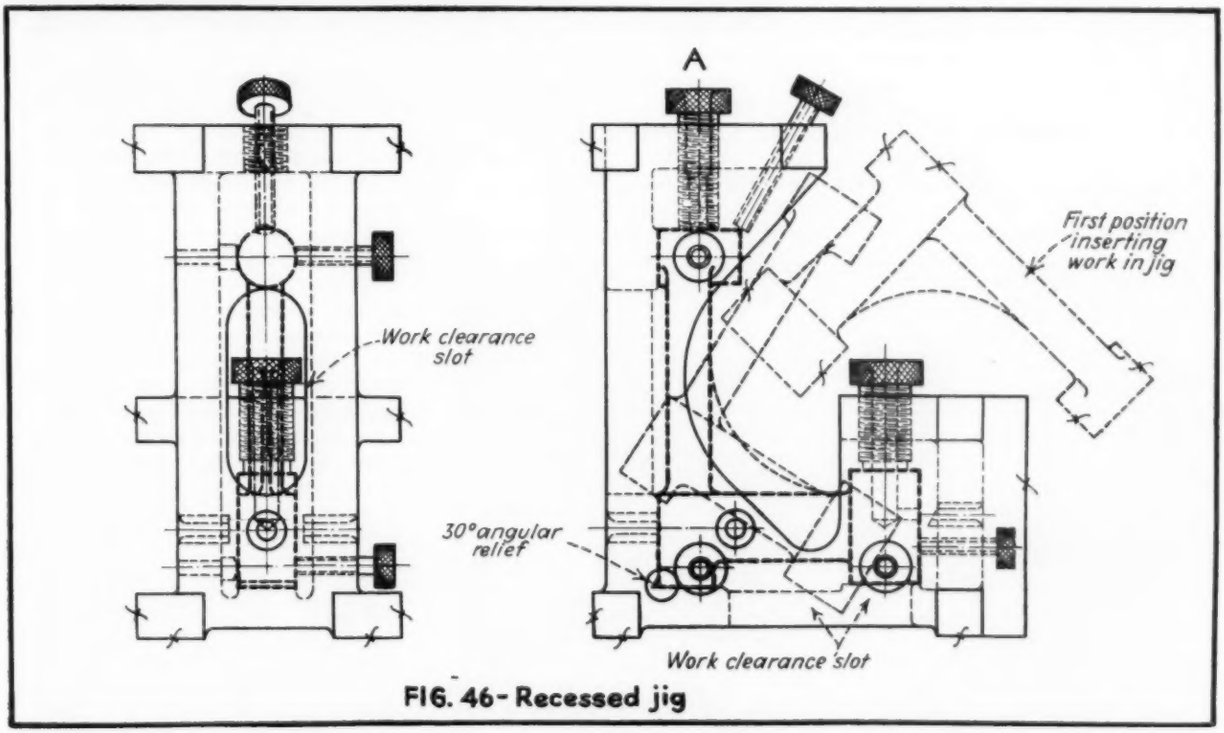
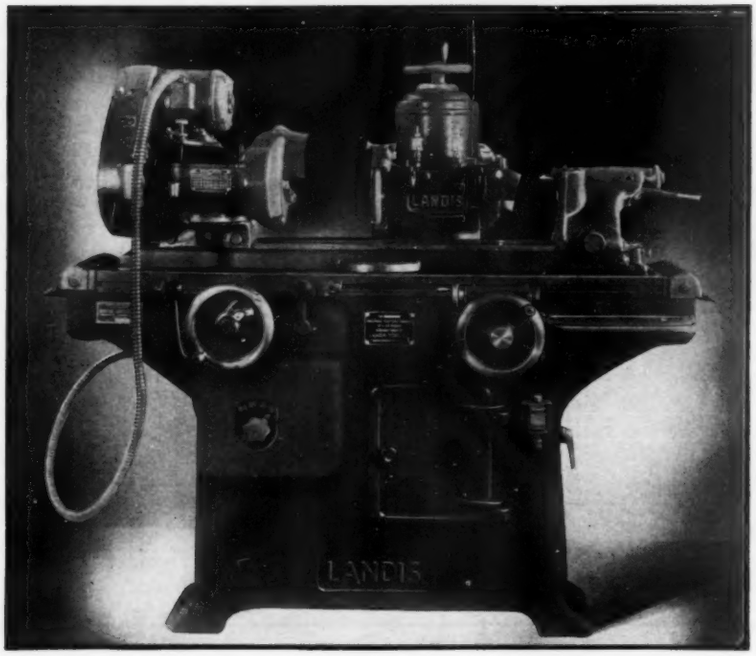


FIG. 46-Recessed jig

Shop Equipment News



The wheel spindle housing of this Landis universal grinder may be removed for mounting a special surface grinding head

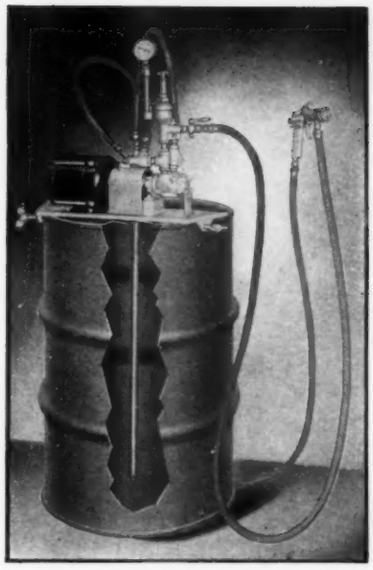
Landis 12 x 28 in. Universal and Tool Grinder

With standard equipment, the 12 x 28 in. universal and tool grinder announced by Landis Tool Co., Waynesboro, Pa., is suitable for many surface grinding and internal grinding operations in addition to the usual external cylindrical operations. Gear cutters, milling cutters, reamers, taps and similar parts may be resharpened economically. Extra equipment includes the necessary attachments for grinding hobs, circular form tools, large saws, staggered-tooth gear cutters and other special operations.

The wheelhead may be swiveled 90 deg. in either direction. It may be raised or lowered and fed toward or away from the work. The headstock may be swiveled as much as 90 deg. for face grinding. It may be used for either dead-spindle or live-spindle work. There are provided a power work-table traverse with an assortment of traversing speeds, power work-spindle rotation, and a two-speed hand traversing mechanism. The cross-feed handwheel is supplemented by a fine cross feed handwheel.

Wheelhead motor is mounted on the rear of the head from which point it drives the spindle by means of a V-belt. The entire wheel spindle housing may be easily removed when it is desired to apply a special surface grinding head. Headstock is provided with a constant-speed motor, and three headstock speeds are obtained by shifting a single V-belt at the left-hand end of the head.

Specifications: Maximum distance between centers with universal headstock, 28 in.; maximum distance between centers with left-hand footstock, 33¾ in.; maximum weight machine will carry on centers, 200 lb.; maximum diameter machine will grind with full size wheel, 12 in.; floor space, 51 x 87 in. Maximum traverse of work table, 30 in.; length of grinding at one setting, 28 in.; work table traverse per minute, 12 to 60 in.; swivel table graduated to grind included angle of 20 deg. Grinding wheel spindle speeds of 2,385, 3,180 and 4,000 r.p.m. are provided. Total grinding wheel cross feed movement is 8 in. and maximum vertical distance from top of table to center of grinding wheel is 12 in. A 1-hp. 1,800-r.p.m. motor is required for the grinding wheel, while a ½-hp. 1,200-r.p.m. motor is used for the traverse drive and a 1/6-hp. motor is used for the headstock drive. Weight of machine is 3,500 lb.



DeVilbiss Type QB Fluid Pump

Clear varnish, clear lacquer and other non-pigmented finishing material is delivered from the shipping container direct to the spray gun by the Type QB fluid circulating pump, manufactured by The DeVilbiss Co., Toledo, Ohio. This pump draws material out of the drum and generates sufficient pressure in the pump head to feed the fluid to the spray gun at a correct, predetermined pressure. Speed of operation is limited only by the operator's ability to handle the gun.

"Thermo-Grip" No. 10 Electric Pliers

Having capacity to handle pipe or fittings up to 4 in. diameter, the No. 10 "Thermo-Grip" electric pliers announced by Ideal Commutator Dresser Co., 1439 Park Ave., Sycamore, Ill., are similar to the No. 5 pliers previously announced, (*AM*—Vol. 80, page 532). These pliers can be used to sweat joints without unsweating adjacent connections; they hold the work firmly while soldering, heat the work evenly from both sides and eliminate open flame hazards.

Colonial High-Speed Broaching Machine

The Colonial Broach Co., Detroit, Mich., has adapted a high-speed, horizontal, automatic pusher-type broaching machine for broaching both ends of gear carrying rods for automobile adjustment front-seat mechanisms. Rods are loaded in a magazine at the top of the machine and are released into place automatically, two at a time. The rods are ejected at the end of the stroke completely finished.

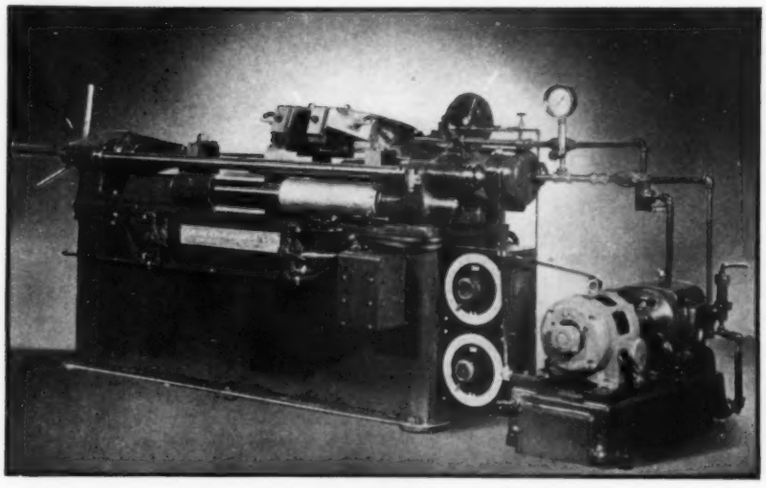
Broaching cycle is entirely automatic with continuous operation. Parts are loaded in the hopper and drop into the fixture which carries them through the broaches. Broaches are arranged first to rough shear the ends of the rods to length, next a V-slot is cut in both ends of the rod to permit spreading to lock the assembled gear on the rod. As the rod progresses through the operation the two flats on each end of the rod are then broached.

Machine is hydraulically operated with a cutting stroke of 30 ft. per min., and a fast return of 60 ft. per min. Production is approximately 600 pieces per hr., which includes complete finish broaching of both ends from the rough.

Thomson-Gibb Model F-29 Precision Flash Welder

With capacity for 3⅛-in. high-carbon steel drill shanks or high-speed steel cutting ends, the Model F-29 precision flash welder announced by Thomson-Gibb Electric Welding Co., 164 Pleasant St., Lynn, Mass., is claimed to flash weld 25 to 80 small size drills per hour. Larger size drills can be welded at the rate of 10 to 25 per hr. Air-operated, vertical open-end type clamps are an integral part of the machine platens. Both front jaws of these clamps are provided with full horizontal adjustments and both upper jaws are of bronze alloy to carry the current and provide for efficient heat distribution. Standard clamps with suitable dies will take rectangular sections with maximum dimensions up to 5 in., and with areas not over 7.7 sq.in. Tubular sections are limited to a maximum of 4⅝-in. outside diameter and an area of 8 sq.in.

Push-up is by means of a hydraulic pressure cylinder which is powered



with an oil pump driven with a 5-hp. motor. A dial indicator multiplies platen travel at the rate of 18 to 1. Voltage regulation is by means of taps with 8 points of voltage regulation for welding and 8 points for annealing. Floor space required is 144x60 in. and weight is 9,400 lb.

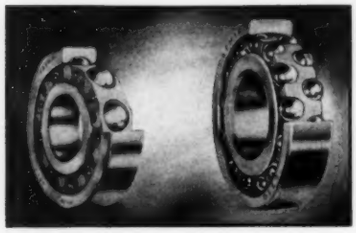
Lee Keyless Drill Chucks

A line of "Knock-Out" keyless drill chucks adaptable to all types of drilling equipment has been announced by K. O. Lee & Son Co., Aberdeen, S. D. No tools, wrenches or keys are required for the operation of these chucks, and it is claimed that a light twist of the feedscrew cap is sufficient to grip the drill hard enough for regular work.

Design of the jaws and cone provides positive alignment and all parts contributing to accuracy, strength and durability are hardened and finish ground. The five sizes now available have capacity ranges from 0 to ¼ in., 0 to ⅜ in., 0 to ½ in., ⅜ to ⅝ in., and ¼ to ⅞ in.

Fafnir Heavy-Duty Ball Bearings

The Fafnir Bearing Co., New Britain, Con., has added a series of high-capacity ball bearings to meet the severe problems of shock loads, vibration and wear coincident with the operation of heavy-duty machinery. These bearings are furnished in the heavy-duty series with specially designed, sturdy, wear - resistant bronze retainers.



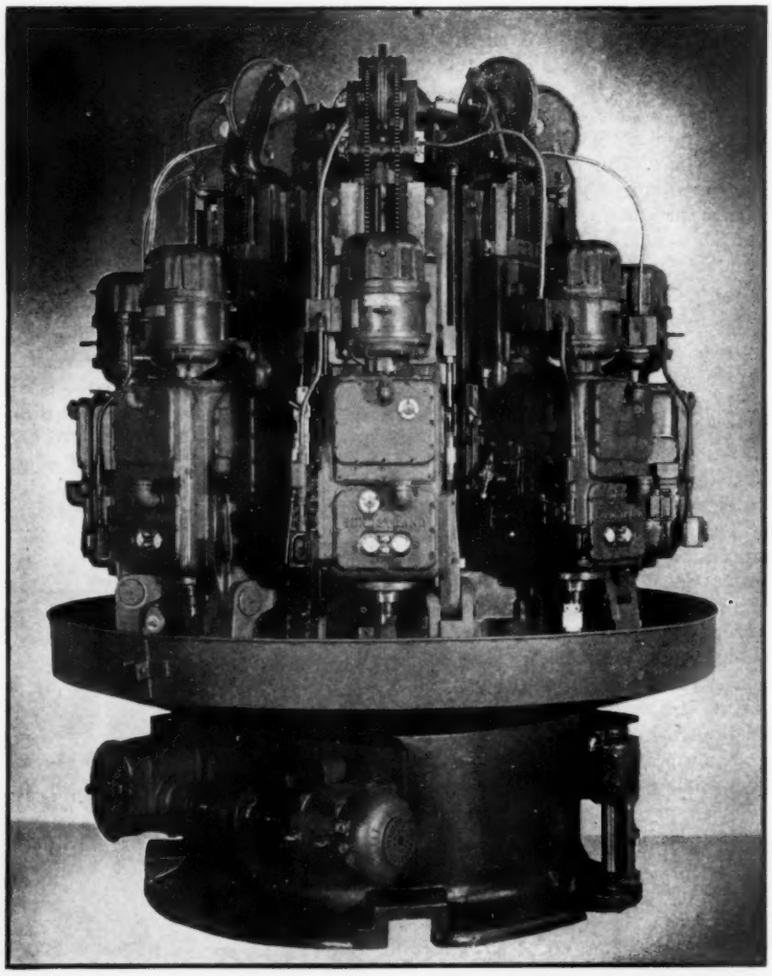
Sundstrand 8-Spindle Vertical Lathe

Designed for rough turning and crowning cast-iron pistons, the 8-spindle vertical lathe manufactured by the Sundstrand Machine Tool Co., Rockford, Ill., has a heavy base on which an octagonal column is rotably mounted. An electric motor provides power for rotating the column through a speed reducer and a gearbox which contains pick-off gears for changing speed of column rotation.

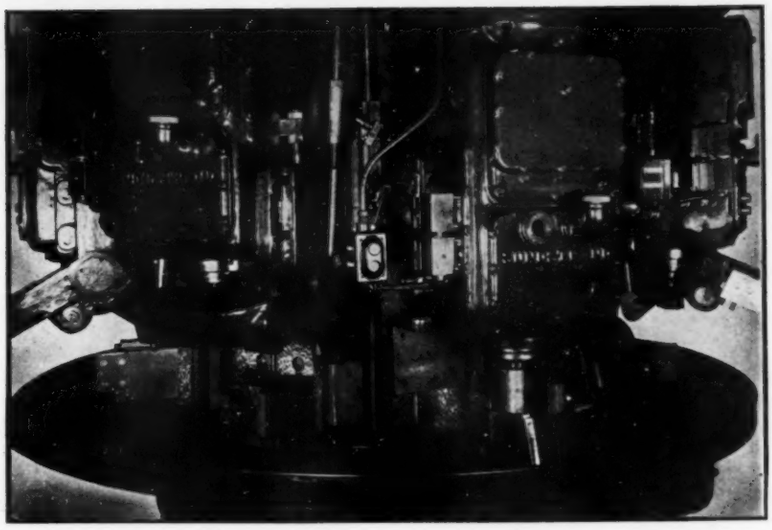
On each face of the octagonal column is securely bolted a sub-base having ways on which a Sundstrand self-contained hydraulic unit travels vertically in an automatic cycle of rapid approach, feed and quick return which is governed by easily adjusted dogs. On the spindle of each hydraulic unit is a push-button controlled hydraulically-operated expanding chuck for holding the work-piece. At the lower end of each sub-base is mounted a stationary tool block. As the central column rotates, downward movement of the hydraulic unit feeds the work-piece against the tool to turn the outside diameter of the piston.

Pivoted on the side of each hydraulic unit is a heavy bell crank having its inner end connected to a stationary adjustable rod. This arrangement causes the bell crank to swing about its pivot as the hydraulic unit moves downward. At the proper portion of the tool cycle, the tool carried on an arm of the bellcrank turns the curved head of the piston to the correct radius.

At the right of the operator's position is a four-button station in which



Eight standard self-contained hydraulic units are vertically mounted on the rotable column of this Sundstrand vertical lathe. Operation is automatic except for loading and unloading the work-pieces



Work-pieces are gripped on hydraulically operated expanding chucks mounted on the spindles of the self-contained hydraulic units of this vertical lathe. Crowning of the piston head is accomplished by a tool mounted in an arm of a heavy bellcrank

one pair of buttons starts and stops rotation of the central column, the other pair starts and stops the eight motors which drive the hydraulic units. In normal operation, rotation of the central column is continuous. As a hydraulic unit approaches the operator, he presses one of the buttons in the control box on the unit, this causes the hydraulically operated chuck to contract and release the work-piece. The operator then substitutes a rough casting for the piece of work which has just been turned and presses the other button in the control box. This causes the chuck to expand and grip the new work-piece securely. As the central column continues to rotate it passes a limit switch which starts the automatic operating cycle of the hydraulic unit on which the work-piece has just been changed.

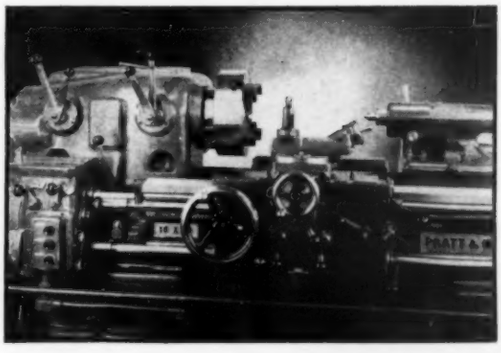
As rotation of the column continues the hydraulic unit feeds downward, turns and crowns the work-piece and then automatically returns to its upper position. By this time the column has practically completed one revolution and the hydraulic unit is approaching the operator again for changing work-pieces. In the meantime the work-pieces on the other seven hydraulic units have been changed successively as each one has passed before the operator in its turn.

Pistons measuring 3½ in. diameter by 4¼ in. long are turned by this machine at the rate of slightly more than 400 per hour at 85 per cent efficiency.

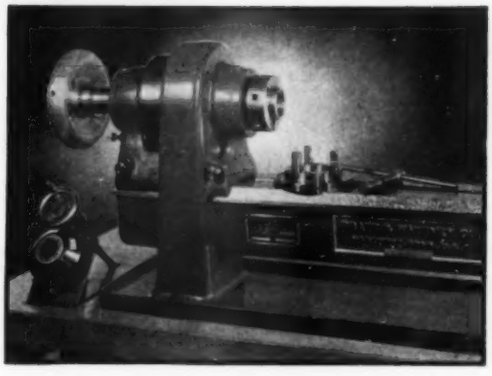
P. & W. Cam-Lock Spindle Nose

Pratt & Whitney Division, Niles-Bement-Pond Co., Hartford, Conn., has announced development of the Cam-Lock spindle nose which holds faceplates and chucks true and rigid with safety to the operator. This spindle nose has six wrench-operated Cam-Locks and the faceplates and chucks have three, four or six studs to match, depending on their size and weight.

This spindle nose has been developed under the procedure of the American Standards Association and is designated as Lathe Spindle Nose Type D-1. It is interchangeable with American standard spindle noses for turret lathes and automatic lathes and it is feasible to borrow a chuck from a turret lathe and use it on an engine lathe.



This 16 x 30 in. Pratt & Whitney engine lathe is equipped with a Cam-Lock spindle nose for faceplates and chucks. It takes less than a minute to mount a chuck



The Pratt & Whitney bench lathe is now equipped with a Cam-Lock spindle nose. Chucks for these lathes have three studs to match the wrench-operated Cam-Locks

"Mogul" Metallizer Gun

Metallizing Co. of America, Inc., 1351 East Seventeenth St., Los Angeles, Calif., has announced the "Mogul" metallizer gun for use with No. 11 B&S gage wire or ⅛ in. diameter rods or wire. Design of the gas head as-

sembly is such that the gun can be lighted without wire or rod in the wire nozzle, this feature makes it possible to spray rods of material which is not obtainable in the form of wire. The "Mogul" gun uses simultaneous valve control in which the gases and air are turned on and off in proper sequence. This eliminates the necessity for delicate adjustments.

It is claimed that this gun will produce a very fine grain coating at the following average rates of deposit: stainless steel, 6.1 lb. per hr.; monel, 4.9 lb. per hr.; copper, 9.9 lb. per hr.; brass, 11.5 lb. per hr., and zinc, 25.0 lb. per hr. Lead, tin, cadmium and babbit metal as well as various grades of carbon steel can be deposited with this gun.

B-K Die-Filing and Lapping Machine

Primarily designed for machine finishing shoulder punches, the B-K filing and lapping machine offered by Brickner-Kropf Machine Co., Muskegon Heights, Mich., is claimed to be equally efficient wherever machine filing or lapping is required. The file holder may be quickly removed from the work without disturbance of any adjustment. Table and head are both of the tilting type and one wrench only is required for all adjustments.

Specifications: Table, 8¾ x 9 in.; distance between table and head, 3 in.; stroke, 0 to 1 in.; adjustment of file holder, 3½ in.; height of table above floor, 37 in.; standard speed, 700 r.p.m. Drive is through a single V-belt from a ¼-hp. motor. Net weight is 160 lb.

"Davey" Portable Balancing Equipment

The Electrocon Corp., 6 Varick St., New York, N. Y., has announced several improvements in design of the "Davey" portable balancing equipment. A complete set of this equipment is shown in the illustration. This outfit is suitable for balancing large turbines and auxiliary machines, such as fans, exhausters, pumps and motors.

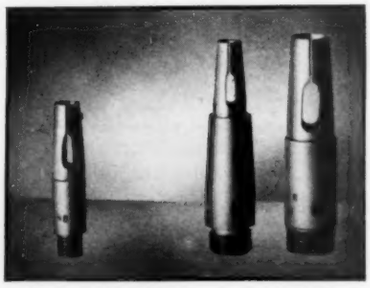
The Model S-2 Vibrometer, which measures in two directions simultaneously and also indicates wave form, is shown at the right of the illustration. The single-direction Model 1 Vibrometer is in the center. These two instruments may be used interchangeably. The Model 3 stroboscopic lamp with three neon tubes is shown at the left.

In the left foreground, the breaker head and phase adjuster is shown coupled to the synchronous motor unit. This unit is a new feature used for balancing 60-cycle machines running at 3,000, 1,800 or 1,200 r.p.m.

"H & G" Type K Feed Fingers

Eastern Machine Screw Corp., New Haven, Conn., announce a line of "H & G" feed fingers for feeding stock on automatic screw machines. Known as Type K fingers, these units are designed so that the same finger can be used on many different makes and sizes of machines. The fingers are designed and proportioned for the size of stock they are to feed, rather than for the size of machine. This assures uniform gripping pressure. Inexpensive adapters are provided to fit the different sizes and makes of feed tubes and give the proper over-all length for each machine.

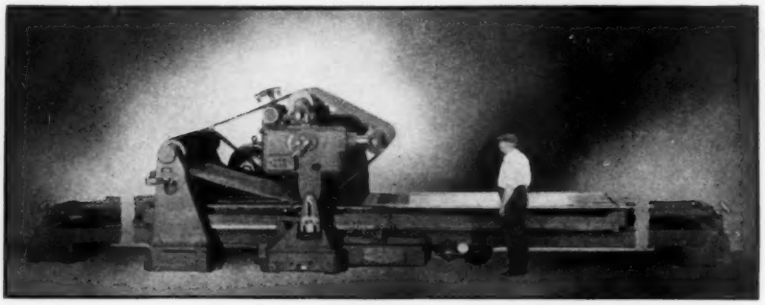
Fingers for a number of different stock sizes are made from one blank size, there being only seven blank sizes to take in the range from $\frac{1}{16}$ to 1¼ in.



Mattison No. 453 Sheet Grinder

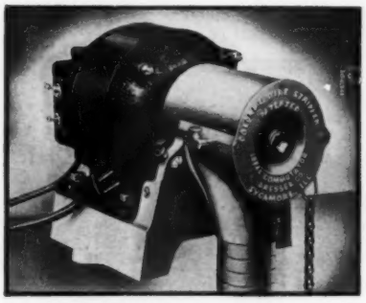
Designed for grinding stainless steel and other alloy sheets, the No. 453 wide-belt sheet grinder, announced by Mattison Machine Works, Rockford, Ill., is arranged for the proper application of factory-coated abrasive belts that are claimed to provide a superior finish with even texture and economy. Table controls for this machine are located in the front for easy access by the operator. Contact rolls are removable and rolls of any degree of cushion may easily be substituted.

This grinder can be furnished in various widths and lengths. The machine illustrated is designed to carry belts 50 in. wide and to grind sheets 48 in. wide by 14 ft. long.



Ideal "Colonial" Wire Stripper

The "Colonial" wire stripper, announced by Ideal Commutator Dresser Co., 1439 Park Ave., Sycamore, Ill., employs the principle of centrifugal action, which eliminates the necessity for springs and levers. The double-edge blades in the stripping chamber fly outward in motion and a slight pressure on the pedal closes the blades to within 0.001 in. of the diameter set by the dialed micrometer gage. When the wire is inserted into the stripper, insulation is cut clean and the wire is properly



twisted and polished, ready for terminals or soldering. The duplex blades are of tool steel and can be resharpened indefinitely.

As some wires are twisted from right to left, the machine is designed to operate counter-clockwise when desired, stripping as efficiently in that direction as it does clockwise. A small switch controls the direction of rotation. An adjustable stop is provided for any length of strip up to 2 in. Unit is driven with a ¼-hp. reversible-type, heavy-duty, ball-bearing motor and it requires no special installation. A flexible metal tube carries waste strippings to a container.

Westinghouse "Glassteel" Lighting Diffuser

Designed properly to distribute the light from the 250-watt high-intensity mercury lamp where the mounting height is under 18 ft., the Glassteel diffuser announced by Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., is suitable for lighting machine shops, plating and polishing rooms, assembly lines and departments, pattern shops, tool rooms, stamping departments, finishing and inspection departments. The diffuser consists of a white porcelain-enameled reflector, which directs the light downward, and a diffusing glass globe.

Skilsaw Slow-Speed High-Torque Drills

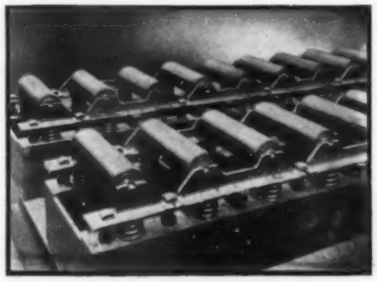
Two slow-speed, high-torque units have been added to the line of ball-bearing electric drills manufactured by Skilsaw, Inc., 3310-20 Elston Ave., Chicago, Ill. Of ¼- and ½-in. capacity, these drills have been developed particularly for drilling in steels of high nickel content.

Both models are available in speeds of 350, 450, 600 and 750 r.p.m. Aluminum-alloy bodies give these drills

strength, durability and light weight. The ¼-in. drill is 14 in. long and weighs 6½ lb. The ½-in. tool has a length of 14½ in. and a weight of 8 lb.

Benjamin Diffuser

The "Silvered Lamp" luminous-top, diffusing reflector has been developed by Benjamin Electric Mfg. Co., Des Plaines, Ill., for use with Silver-Bowl type lamps, where it is desired to provide soft, even illumination with minimized direct and reflected glare. This reflector provides a wide-spread distribution of light, and has a deep, overhanging skirt which shields the portion of the lamp above the bowl from view at normal angles of vision, preventing glare from filament images. An opal glass section in the neck of the reflector permits approximately 5 per cent of the light output of the reflector to reach the ceiling to relieve contrast conditions in the room. These units are available in two sizes for 200 and 300-500 watt lamps.



Mathews Resilient Roller Conveyor

The resiliently mounted conveyor, announced by Mathews Conveyor Co., Ellwood City, Pa., is designed for use where heavy loads are to be lifted on to and transported by the conveyor. In this type conveyor, each roller carries its proportionate share of the load and bearing friction is reduced to normal. This design eliminates many of the causes for bearing failures and high maintenance costs of roller conveyors. It is claimed that a conveyor of this type permits the movement of heavy loads with a minimum of abuse to the product and to the conveyor.

Udylite Plating Baskets and Trays

The Udylite Co., 1651 East Grand Blvd., Detroit, Mich., has announced a complete line of all-welded dipping baskets and trays for plating use. It is claimed that the all-welded construction of these baskets and trays permit carrying heavy loads without bulging under rough usage. Cross member reinforcement is provided at points of stress.

Dipping baskets of the bail type are furnished with swivel or rigid handles. Trays are furnished with either solid or mesh sides. Both

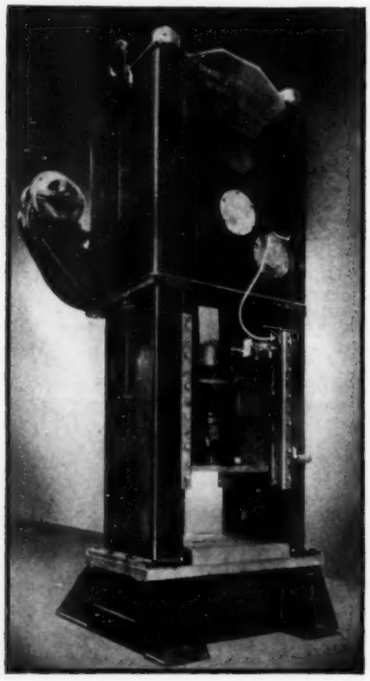
Udylite dipping baskets at left, and trays at right, are of all-welded construction and can be furnished in standard or special sizes and shapes

baskets and trays can be furnished in standard shapes, gages of wire and mesh and made of steel, brass, copper, aluminum, monel and nickel chrome. Also offered is a "Duro-Welded" reinforced rigid bail-type steel basket covered with hard or soft rubber that is highly resistant to all acids except straight nitric and sulphuric. This basket is furnished in two sizes, 10 x 10 in., and 12 x 12 in., in ½-in. mesh or larger.

"Verson" Single-Crank Eccentric Presses

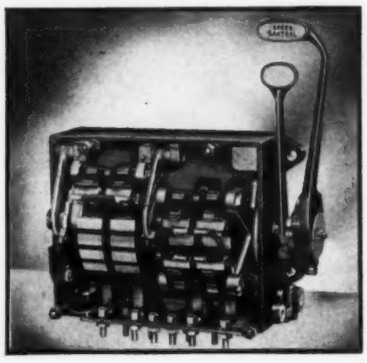
The crankshaft is eliminated entirely from the design of the "Verson" line of single-crank, full eccentric, front to back presses announced by the Allsteel Press Co., 12015 Peoria St., Chicago, Ill. The crank motion for these presses is obtained by means of an integral eccentric and gear which rotate on the main shaft. This construction is claimed to eliminate all torque in the mainshaft with the result that the capacity of the press is considerably increased.

These presses are equipped with an air or hydraulically operated clutch and brake, insuring instantaneous and even holding pressure. Pitman connection is of the barrel type, which keeps the large adjustment screw in a vertical position at all times. The ram is adjusted by a hoist type motor and is counterbalanced by air cylinders located in the column. Main drive is through V-belts, or any other drive required to suit individual installations.



"Automatic" Rotary Truck Controller

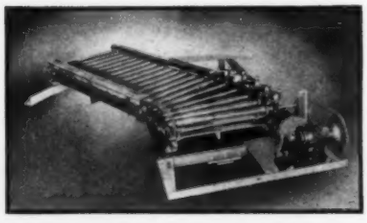
The Automatic Transportation Co., 111 West 87th St., Chicago, Ill., has announced adoption of an industrial truck controller which is rotary in action and has stator segments of the



commutator type. These are unit molded into a permanent insulated base with no loose segments and no separate parts. This controller has been developed to meet the demand for a reliable voltage control, smooth power performance and increased controller life. Brushes are provided with a constant spring tension which is self compensating and requires no manual adjustment. A built-in dynamic brake control is provided, as is a fool-proof reversing speed safety control.

"Standard" Radial Conveyor Switch

Designed to permit immediate discharge of commodities at any one or at numerous points, the full-powered radial switch for use with roller conveyors, offered by the Standard Conveyor Co., North St. Paul, Minn., is controlled by a push-button. This switch is said to overcome the difficulties encountered with some com-

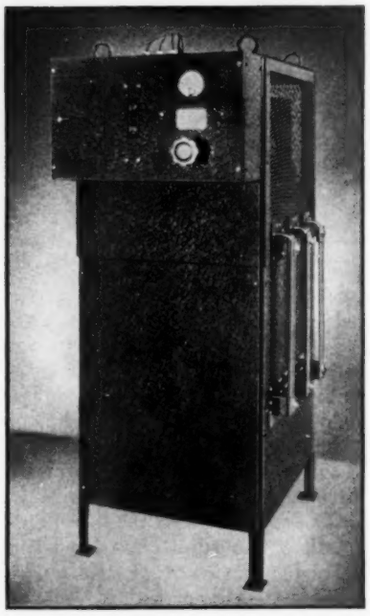


modities which cannot be diverted by power belts or slot conveyors because of their weight or the construction of the carrying surface.

The switch is moved to its various positions by power and after the operator presses a push button the operation is entirely automatic. The switch stops when it reaches the discharge position and after the commodity has passed over it, returns to normal position without further attention.

Hanson-Van-Winkle-Munning Plating Rectifier

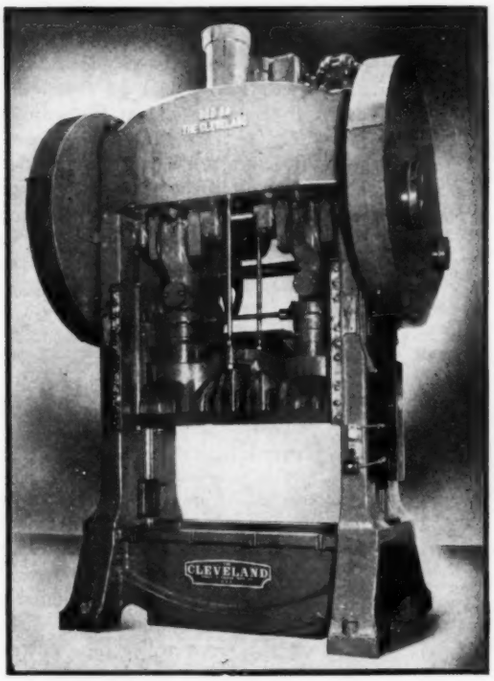
Copper-oxide plate type rectifiers, manufactured by the Hanson-Van Winkle-Munning Co., Matawan, N. J., provide a practical means of converting alternating current into direct current for use in the electroplating industry. Offered in several sizes, these units provide a wide range of direct current supply for use in plating operations. Each unit con-



sists of power transformers, a small fan for air circulation, the rectifier unit and necessary control equipment. The units are equipped with De-ion circuit breakers which serve both as a switch and as a protection against overloads and short circuits. Six volt units are offered in capacities up to 10,000 amp.

Cleveland No. 80-D-84 Double-Crank Press

The straight-sided, double-crank press offered by The Cleveland Punch & Shear Works Co., 3900 St. Clair St., Cleveland, Ohio, can be furnished in a wide range of sizes and can be equipped with a style of clutch to suit individual requirements. The No. 80–D–84 press shown is arranged with twin drive to the crankshaft through herringbone gears which run in oil. Air counterbalance is provided

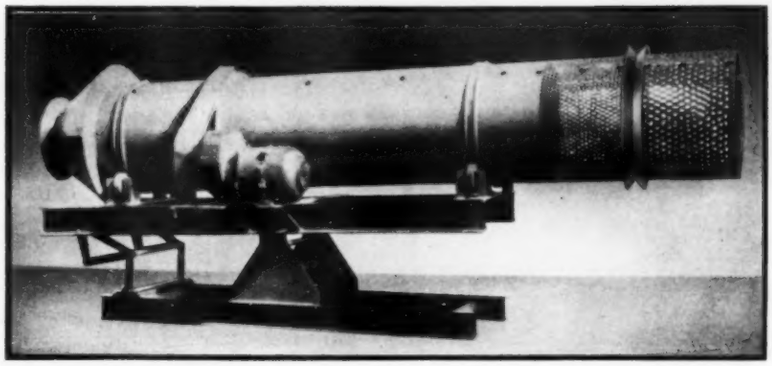


for the slide which is power-adjusted by an individual motor. This press is equipped with an electrically controlled hydraulic clutch with a four-station selector for momentary, long, continuous and inching operations. The clutch is so designed that when released the oil is not exhausted or drawn out of the line but is merely backed up sufficiently to release the clutch. The brake is spring-loaded as a safety precaution so that in the event of failure in any part of the line, the clutch is immediately disengaged and the brake applied, bringing the press to an immediate stop.

Barber Model 4 Tumbling Machine

Equipped with a conical-shaped hopper and screens of two different mesh sizes, the Model 4 tumbling machine manufactured by Barber Tumbling Machine Works, Box 283, Oak Park, Ill. can be used to separate the tumbled product from all saw dust, scale and such pieces of scrap metal as will pass through the screen mesh while the load is being discharged. Two screen sections, each having a different size mesh, permit separation of mixed products of two different sizes during the regular screening process.

With the cylinder set approximately level and material fed into the hopper continuously, newly introduced material causes the material ahead of it to crowd toward the cylinder's discharge end. As the tumbled road moves out of the cylinder's solid steel section it encounters first a small mesh screen which sifts out all scale, sawdust and punchings; the remainder of the load passing along encounters next a large-mesh screen which sifts out the smaller of the two products, the larger product discharging from the screen's end.



Benjamin Reflector "Stock-Bin-Lite"

A specially designed reflector, which effectively solves the problem of uniform lighting for bins, shelves and stacks in stock rooms, tool cribs and similar location, is offered by Benjamin Electric Mfg. Co., Des Plaines, Ill. The "Stock-Bin-Lite" reflector provides uniform illumination from top to bottom of the tiers and directs light into the interior of bins. The deep, trough-shaped reflector directs maximum light downward to the bins near the floor, while the V-shaped deflector bars, suspended below the reflector, directs light upward to light the top-most bins. Three sizes of reflectors are available for 60, 75-100 and 150 watt lamps.

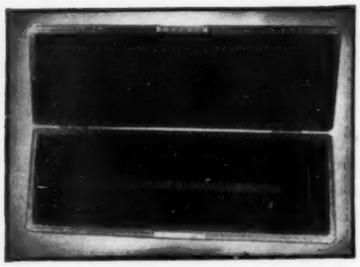
Morse High-Torque Free-Wheeling Clutch

A high-torque, indexing and free-wheeling clutch, designed to fill the need for a simple clutch to transmit power in one direction, has been announced by Morse Chain Co., Div. of Borg-Warner Corp., Ithaca, N. Y. It is claimed that the design of this unit embodies features to ensure smooth, positive cam action and to eliminate ratchet noise and backlash. Multiple cams are used, spaced alternately with hardened steel rollers to distribute the load evenly on each cam.

"Mico" Ruled Glass Scales

Three ruled glass scales are offered by Mico Instrument Co., 10 Arrow St., Cambridge, Mass., for use in measuring problems where a transparent scale can be used in direct contact with the work to avoid parallax. The scales have been ruled on a precision ruling machine and, while they are accurately spaced, they are not intended for extreme precision line standards as the lines are 0.002 to 0.003 in. wide. They are for use at unity to 10 or 15 diameters magnification. The lines and figures are filled by a chemical method which results in good visibility despite the narrow lines. The glass blank is 7½ in. long.

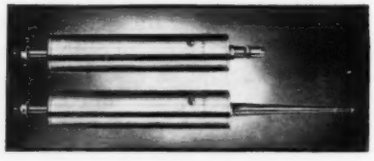
A 6 in. long scale ruled in thirty-secondths of an inch, a 6 in. long scale



ruled in tenths of an inch, and a metric scale 15 cm. long, ruled in millimeters are available. Ten to fifteen footcandles illumination is a good lower limit of the illumination required for the proper use of these scales. When used on a black or darkly colored surface the lines can be made to stand out by choosing the proper angle at which to view them.

Dumore Quills for No. 7 Grinder

Three new quills for use with No. 7 grinders have been announced by The Dumore Co., Racine, Wis. The upper quill shown in the accompanying illustration is known as the "P" quill. It is equipped with a ¼-in. chuck for using mounted wheels and a sleeve collet of ⅛-in. capacity. Its primary



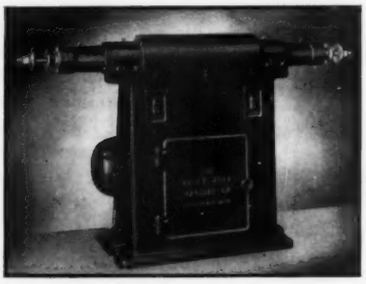
use is for grinding small internal holes of diameters less than 1 in. to a depth of 1¼ in. The lower quill is the "N-6", which is capable of grinding a hole ⅛ in. in diameter to a depth of 6 in. The "N-5" quill is equivalent to the "N-6" unit, except that its maximum depth of grind is 5 in.

Udylite "Flexogrip" Polishing Adhesive

"Flexogrip" polishing-wheel adhesive, offered by Udylite Co., 1651 E. Grand Blvd., Detroit, Mich., is claimed to give a longer wheel "head" life, because it does not chip or break off. Shipped in standard steel sealed containers, flexogrip requires no thinner. It is applied as received. Low surface tension and high penetrating qualities permit it to seep into the fibers of the wheel or belt material and also into the pores of the abrasive grains. Two types are available: the first, Type *A* is specially prepared for grains coarser than No. 80; Type *B* holds abrasive grains finer than No. 80, up to and including FF grade abrasives.

Hisey-Wolf Buffing and Polishing Machines

A line of buffing and polishing machines, announced by the Hisey-Wolf Machine Co., Cincinnati, Ohio, are arranged for external motor mounting and will accommodate any make or type of motor. Speed can be readily changed by changing the diameter of

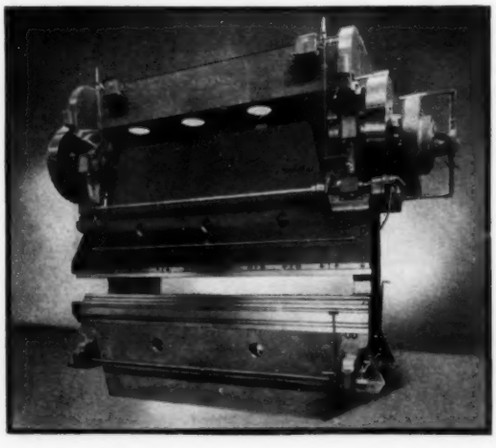


the motor V-belt sheave. Spindles are of one-piece construction and are mounted in over-size ball bearings located close to the wheels. The machine illustrated has a separate motor drive for each of the two spindles. These machines are available in sizes ranging from 3 to 25 hp.

"Verson" Allsteel Press Brake

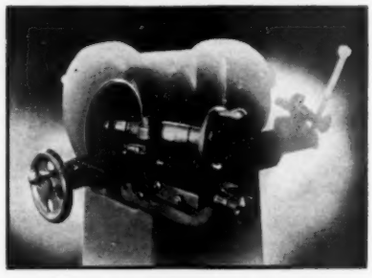
The Allsteel Press Co., 12015 Peoria St., Chicago, Ill., has added a complete line of "Verson" press brakes to its list of products. There are five series of press brakes, comprising 20 different standard sizes. Where necessary standard dimensions may be varied to suit individual requirements and almost any size press is obtainable within the outside limits of the line.

These brakes are regularly furnished with a V-belt drive, gear-tooth drive friction clutch, motor adjustment on the ram, automatic force-feed lubricatiors, and lower die holder. One of the features of the design is that the elevating shaft is split and connected by a jaw coupling. This arrangement allows either side of the ram to be raised or lowered individually for realignment or taper work.



Landis Cutter Disk Grinding Attachment

Landis Machine Co., Waynesboro, Pa., is offering a grinding attachment for resharpening cutter disks. This attachment is for use on any Landis chaser grinder and was particularly designed for regrinding cutter disks used on the Geist roller pipe cutter. The attachment will take disks 6, 7 or 8 in. in diameter. By removing the steadyrest in front of the straight wheel on the chaser grinder, room is provided for bolting the attachment directly to the machine bed.



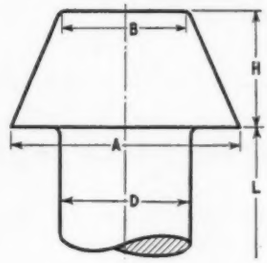
S. W. Air-Drying Spot-Welding Primer

The Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland, Ohio, has announced an air-drying, spot welding black primer that was developed primarily for automotive production manufacturers. Listed as Primer No. X9185, this primer drys to the touch in 10 or 15 min. and parts treated can be handled for spot welding in 20 to 30 min. Parts so treated can be instantaneously spot welded with low voltage and low pressure. Burning away of paint surrounding the spot weld is eliminated.

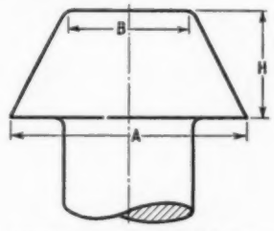
American Machinist — REFERENCE BOOK SHEET ©

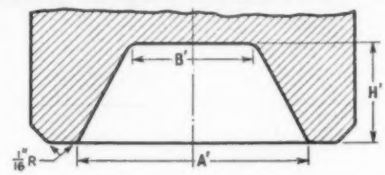
American Standard Large Rivets—II

With these tables and those published earlier (*AM*—Vol. 81, page 307) the new ASA standard "Large Rivets—B18" is complete



MANUFACTURED HEAD AFTER DRIVING, ALSO DRIVEN HEAD





HOLD-ON (DOLLY BAR), ALSO RIVET SET IMPRESSION

Table 3. Cone Head (Manufactured Shape)

Diameter of Body D			Major Diameter of Head A			Minor Diameter of Head B			Height of Head H	
Nominal	Max	Min	Basic	Max	Min	Basic	Max	Min	Max	Min (Basic)
½ 0.500	0.520	0.478	0.875	0.938	0.844	0.469	0.532	0.438	0.469	0.438
⅝ 0.625	0.655	0.600	1.094	1.157	1.063	0.586	0.649	0.555	0.578	0.547
¾ 0.750	0.780	0.725	1.313	1.391	1.282	0.703	0.781	0.672	0.687	0.656
⅞ 0.875	0.905	0.850	1.531	1.609	1.500	0.820	0.898	0.789	0.797	0.766
1 1.000	1.030	0.975	1.750	1.828	1.719	0.938	1.016	0.907	0.906	0.875
1 ⅛ 1.125	1.160	1.098	1.969	2.063	1.938	1.055	1.149	1.024	1.031	0.984
1 ¼ 1.250	1.285	1.223	2.189	2.283	2.158	1.172	1.266	1.141	1.141	1.094
1 ⅜ 1.375	1.415	1.345	2.406	2.500	2.375	1.289	1.383	1.258	1.250	1.203
1 ½ 1.500	1.540	1.470	2.625	2.719	2.594	1.406	1.500	1.375	1.376	1.313
1 ⅝ 1.625	1.665	1.588	2.844	2.938	2.813	1.523	1.617	1.492	1.485	1.422
1 ¾ 1.750	1.790	1.713	3.063	3.172	3.032	1.641	1.750	1.610	1.594	1.531

All dimensions given in inches.

Proportions (Basic): A = 1.75D; H = 0.875D; B = 0.938D.

Tolerance for diameter of body is plus and minus from nominal and for ½-inch size equals + 0.020, − 0.022; for sizes ⅝ to 1-inch, inclusive, equals + 0.030, − 0.025; for sizes 1⅛ and 1¼-inch equals + 0.035, − 0.027; for sizes 1⅜ and 1½-inch equals + 0.040, − 0.030; for sizes 1⅝ and 1¾-inch equals + 0.040, − 0.037

The length (L) is measured from the largest diameter of the bearing surface of the head to the point in a line parallel with the axis of the rivet.

Table 10. Cone Head

Manufactured Head after Driving and Driven Head also Hold-On (Dolly Bar) and Rivet Set Impressions

Body Diameter of Rivet D	Manufactured Head after Driving and Driven Head			Hold-On (Dolly Bar) and Rivet Set		
	A	B	H	A'	B'	H'
½ 0.500	0.922	0.469	0.406	0.891	0.469	0.391
⅝ 0.625	1.141	0.594	0.516	1.109	0.594	0.484
¾ 0.750	1.375	0.703	0.625	1.328	0.703	0.578
⅞ 0.875	1.594	0.828	0.719	1.547	0.828	0.688
1 1.000	1.828	0.938	0.828	1.781	0.938	0.781
1 ⅛ 1.125	2.063	1.063	0.938	2.016	1.063	0.875
1 ¼ 1.250	2.281	1.172	1.031	2.219	1.172	0.969
1 ⅜ 1.375	2.516	1.297	1.141	2.438	1.297	1.078
1 ½ 1.500	2.734	1.406	1.250	2.672	1.406	1.172
1 ⅝ 1.625	2.969	1.531	1.344	2.891	1.531	1.266
1 ¾ 1.750	3.203	1.641	1.453	3.109	1.641	1.375

All dimensions given in inches.

Proportions of manufactured head after driving and driven head:

A = 1.827D; B = 0.938D; H = 0.828D.

Proportions of hold-on (dolly bar) and rivet set impressions:

A' = 1.781D; B' = B = 0.938D; H' = 0.781D.

Dimensions have been adjusted to the nearest common fractions.

Table 6. Pan Head (Manufactured Shape)

Diameter of Body D			Major Diameter of Head A			Minor Diameter of Head B			Height of Head H	
Nominal	Max	Min	Basic	Max	Min	Basic	Max	Min	Max	Min (Basic)
½ 0.500	0.520	0.478	0.875	0.938	0.844	0.500	0.563	0.469	0.381	0.350
⅝ 0.625	0.655	0.600	1.094	1.157	1.063	0.625	0.688	0.594	0.469	0.438
¾ 0.750	0.780	0.725	1.313	1.391	1.282	0.750	0.828	0.719	0.556	0.525
⅞ 0.875	0.905	0.850	1.531	1.609	1.500	0.875	0.953	0.844	0.644	0.613
1 1.000	1.030	0.975	1.750	1.828	1.719	1.000	1.078	0.969	0.731	0.700
1 ⅛ 1.125	1.160	1.098	1.969	2.063	1.938	1.125	1.219	1.094	0.835	0.788
1 ¼ 1.250	1.285	1.223	2.189	2.283	2.158	1.250	1.344	1.219	0.922	0.875
1 ⅜ 1.375	1.415	1.345	2.406	2.500	2.375	1.375	1.469	1.344	1.010	0.963
1 ½ 1.500	1.540	1.470	2.625	2.719	2.594	1.500	1.594	1.469	1.113	1.050
1 ⅝ 1.625	1.665	1.588	2.844	2.938	2.813	1.625	1.719	1.594	1.201	1.138
1 ¾ 1.750	1.790	1.713	3.063	3.172	3.032	1.750	1.859	1.719	1.288	1.225

All dimensions given in inches.

Proportions (Basic): A = 1.75D; B = D; H = 0.70D.

Tolerance for diameters (A and B) of head is plus and minus from basic and for sizes ½ and ⅝-inch equals + 0.063, − 0.031; for sizes ¾ to 1-inch, inclusive, equals + 0.078, − 0.031; for sizes 1⅛ to 1⅜-inch, inclusive, equals + 0.094, − 0.031; for 1¼-inch size equals + 0.109, − 0.031.

Tolerance for height of head is plus from basic and for sizes ½ to 1-inch, inclusive, equals + 0.031; for sizes 1⅛ to 1⅜-inch, inclusive, equals + 0.047; for sizes 1½ to 1¾-inch, inclusive, equals + 0.063.

Rivets with fillets under the head of not more than ⅛-inch in radius are acceptable.

Table 11. Pan Head

Manufactured Head after Driving and Driven Head also Hold-On (Dolly Bar) and Rivet Set Impressions

Body Diameter of Rivet D	Manufactured Head after Driving and Driven Head			Hold-On (Dolly Bar) and Rivet Set		
	A	B	H	A'	B'	H'
½ 0.500	0.922	0.500	0.328	0.891	0.500	0.297
⅝ 0.625	1.141	0.625	0.406	1.109	0.625	0.375
¾ 0.750	1.375	0.750	0.484	1.328	0.750	0.453
⅞ 0.875	1.594	0.875	0.578	1.547	0.875	0.531
1 1.000	1.828	1.000	0.656	1.781	1.000	0.609
1 ⅛ 1.125	2.063	1.125	0.734	2.016	1.125	0.688
1 ¼ 1.250	2.281	1.250	0.813	2.219	1.250	0.766
1 ⅜ 1.375	2.516	1.375	0.906	2.438	1.375	0.844
1 ½ 1.500	2.734	1.500	0.984	2.672	1.500	0.906
1 ⅝ 1.625	2.969	1.625	1.063	2.891	1.625	0.984
1 ¾ 1.750	3.203	1.750	1.141	3.109	1.750	1.063

All dimensions given in inches.

Proportions of manufactured head after driving and driven head:

A = 1.827D; B = D; H = 0.656D.

Proportions of hold-on (dolly bar) and rivet set impressions:

A' = 1.781D; B' = D; H' = 0.609D.

Dimensions have been adjusted to the nearest common fractions.

American Standard Large Rivets—II

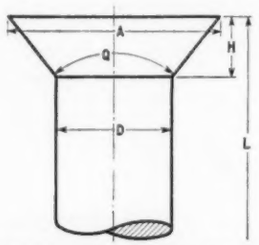


Table 4. Flat-Top Countersunk Head (Manufactured Shape)

Diameter of Body D			Diameter of Head A			Depth of Head H		Included Angle of Head Q
Nominal	Max	Min	Basic	Max	Min	Max	Min (Basic)	Deg
½ 0.500	0.520	0.478	0.905	0.936	0.874	0.281	0.250	78
9/16 0.625	0.655	0.600	1.131	1.194	1.068	0.344	0.313	78
¾ 0.750	0.780	0.725	1.358	1.421	1.295	0.406	0.375	78
⅞ 0.875	0.905	0.850	1.584	1.647	1.521	0.469	0.438	78
1 1.000	1.030	0.975	1.810	1.873	1.747	0.531	0.500	78
1 ⅛ 1.125	1.160	1.098	2.036	2.114	1.973	0.610	0.563	78
1 ¼ 1.250	1.285	1.223	2.263	2.341	2.200	0.672	0.625	78
1 ⅜ 1.375	1.415	1.345	2.489	2.567	2.426	0.751	0.688	78
1 ½ 1.500	1.540	1.470	2.715	2.793	2.652	0.813	0.750	78
1 ⅝ 1.625	1.665	1.588	2.941	3.019	2.878	0.876	0.813	78
1 ¾ 1.750	1.790	1.713	3.168	3.262	3.105	0.938	0.875	78

All dimensions given in inches, unless otherwise specified.

Proportions (Basic): A = 1.81D; H = 0.50D; Q = 78 deg

Tolerance for diameter of body is plus and minus from nominal and for ½-inch size equals + 0.020, − 0.022; for sizes ⅝ to 1-inch, inclusive, equals + 0.030, − 0.025; for sizes 1⅛ and 1¼-inch equals + 0.035, − 0.027; for sizes 1⅜ and 1½-inch equals + 0.040, − 0.030; for sizes 1⅝ and 1¾-inch equals + 0.040, − 0.037.

Tolerance for diameter of head is plus and minus from basic and for ½-inch size equals + 0.031, − 0.031; for sizes ⅝ to 1-inch, inclusive, equals + 0.063, − 0.063; for sizes 1⅛ to 1⅜-inch, inclusive, equals + 0.078, − 0.063; for 1¼-inch size equals + 0.094, − 0.063.

Tolerance for depth of head is plus from basic and for sizes ½ to 1-inch, inclusive, equals + 0.031; for sizes 1⅛ and 1¼-inch equals + 0.047; for sizes 1⅜ to 1¾-inch, inclusive, equals + 0.063.

The length (L) is measured from the largest diameter of the bearing surface of the head to the point in a line parallel with the axis of the rivet.

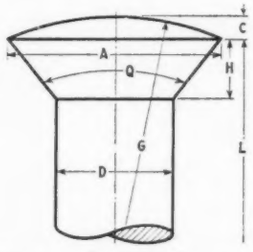


Table 5. Round-Top Countersunk Head (Manufactured Shape)

Diameter of Body D			Diameter of Head A			Depth of Head H		Height of Round Top	Radius of Round Top	Included Angle of Head
Nominal	Max	Min	Basic	Max	Min	Max	Min (Basic)	C	G	Q Deg
½ 0.500	0.520	0.478	0.905	0.936	0.874	0.281	0.250	0.095	1.125	78
9/16 0.625	0.655	0.600	1.131	1.194	1.068	0.344	0.313	0.119	1.406	78
¾ 0.750	0.780	0.725	1.358	1.421	1.295	0.406	0.375	0.143	1.688	78
⅞ 0.875	0.905	0.850	1.584	1.647	1.521	0.469	0.438	0.166	1.969	78
1 1.000	1.030	0.975	1.810	1.873	1.747	0.531	0.500	0.190	2.250	78
1 ⅛ 1.125	1.160	1.098	2.036	2.114	1.973	0.610	0.563	0.214	2.531	78
1 ¼ 1.250	1.285	1.223	2.263	2.341	2.200	0.672	0.625	0.238	2.813	78
1 ⅜ 1.375	1.415	1.345	2.489	2.567	2.426	0.751	0.688	0.261	3.094	78
1 ½ 1.500	1.540	1.470	2.715	2.793	2.652	0.813	0.750	0.285	3.375	78
1 ⅝ 1.625	1.665	1.588	2.941	3.019	2.878	0.876	0.813	0.309	3.656	78
1 ¾ 1.750	1.790	1.713	3.168	3.262	3.105	0.938	0.875	0.333	3.938	78

All dimensions in inches, unless otherwise specified.

Proportions (Basic). A = 1.81D; H = 0.50D; C = 0.19D; G = 2.25D; Q = 78 deg

Tolerance for diameter of body is plus and minus from nominal and for ½-inch size equals + 0.020, − 0.022; for sizes ⅝ to 1-inch, inclusive, equals + 0.030, − 0.025; for sizes 1⅛ and 1¼-inch equals + 0.035, − 0.027; for sizes 1⅜ and 1½-inch equals + 0.040, − 0.030; for sizes 1⅝ and 1¾-inch equals + 0.040, − 0.037.

Tolerance for diameter of head is plus and minus from basic and for ½-inch size equals + 0.031, − 0.031; for sizes ⅝ to 1-inch, inclusive, equals +0.063, − 0.063; for sizes 1⅛ to 1⅜-inch, inclusive, equals + 0.078, − 0.063; for 1¼-inch size equals + 0.094, − 0.063.

Tolerance for depth of head is plus from basic and for sizes ½ to 1-inch, inclusive, equals + 0.031; for sizes 1⅛ and 1¼-inch equals + 0.047; for sizes 1⅜ to 1¾-inch, inclusive, equals + 0.063.

The length (L) is measured from the largest diameter of the bearing surface of the head to the point in a line parallel with the axis of the rivet.

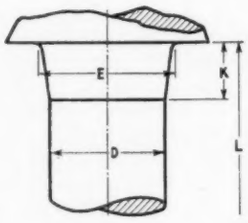


Table 7. Swell-Neck (Manufactured Shape)

Diameter of Body D			Swell Neck E		K
			Diameter Under Head		Length
Nominal	Max	Min	Max (Basic)	Min	
½ 0.500	0.520	0.478	0.563	0.543	0.250
9/16 0.625	0.655	0.600	0.688	0.658	0.313
¾ 0.750	0.780	0.725	0.813	0.783	0.375
⅞ 0.875	0.905	0.850	0.938	0.908	0.438
1 1.000	1.030	0.975	1.063	1.033	0.500
1 ⅛ 1.125	1.160	1.098	1.188	1.153	0.563
1 ¼ 1.250	1.285	1.223	1.313	1.278	0.625
1 ⅜ 1.375	1.415	1.345	1.438	1.398	0.688
1 ½ 1.500	1.540	1.470	1.563	1.523	0.750
1 ⅝ 1.625	1.665	1.588	1.688	1.648	0.813
1 ¾ 1.750	1.790	1.713	1.813	1.773	0.875

All dimensions given in inches.

Proportions (Basic): E = D + 0.0625; K = 0.50D.

The swell neck is applicable to all standard large rivets except the countersunk and round-top countersunk types.

Tolerance for diameter of body is plus and minus from nominal and for ½-inch size equals + 0.020, − 0.022; for sizes ⅝ to 1-inch, inclusive, equals + 0.030, − 0.025; for sizes 1⅛ and 1¼-inch equals + 0.035, − 0.027; for sizes 1⅜ and 1½-inch equals + 0.040, − 0.030; for sizes 1⅝ and 1¾-inch equals + 0.040, − 0.037.

Tolerance for diameter of swell neck under head is minus from basic and for ½-inch size equals − 0.020; for sizes ⅝ to 1-inch, inclusive, equals − 0.030; for sizes 1⅛ and 1¼-inch equals − 0.035; for sizes 1⅜ to 1¾-inch, inclusive, equals − 0.040.

The length (L) is measured from the largest diameter of the bearing surface of the head to the point in a line parallel with the axis of the rivet.

Rivets with fillets under the head of not more than 1/16-inch in radius are acceptable.

Round Table

Wage Increases

"Didn't think things were going so well that you had to play solitaire with the time cards in order to have something to do." Thus Ed greeted his friend as he walked into Al's office late Friday afternoon.

"Never had much time for card games, Ed—always seemed to find other things more interesting."

"But what about this game you're playing now? Those may be important records but surely they can't be so interesting now—why this one's eight months old."

"These time cards have considerable value—they are necessary as a payroll and tax record and, on top of that, they tell a most interesting story about what we've been doing for the past year."

"What of that, Al—last year is over the dam now. The financial statements tell us where we stand, what more do you want to know?"

"Plenty—I want to know *why* the books show their present balances and, equally important, I want to check up on the men we've got working for us."

"Seems to me you're getting mighty fussy. How's that going to help you make bigger and better pumps?"

"In the first place, Ed, these cards help me see the direction our costs are going during the coming year."

"Okay! But, what's this check up on the men you're talking about?"

"Well, Ed, I've got a hunch that this shop is pretty much like most shops, both large and small—a few darned good men are making most of the money for us. The rest of them are probably just coasting along."

"You ought to be able to pick out the slackers without wasting your time with a bunch of time cards—why they're ancient history now."

"Maybe you think you can, Ed—but I want to be able to satisfy myself and the men that my selections are justified."

"Selections—Say! You're got another one of your crazy notions. What are you going to do—pay a bonus with my money?"

"Did you ever stop to think that your share of the earnings would have been a lot less if we had not been able to keep our good men on the job?"

"Guess you're right. What do you have in mind?"

"Don't know yet, probably a raise for the men who are really worth more money."

"If they haven't asked you for more I'd be darned slow about stirring them up now. Don't you remember that old gag about 'letting sleeping dogs lie'?"

"Well these men aren't dogs, Ed,

and you can gamble that they won't stay asleep long with the increasing demand for skilled men. I want to keep several steps ahead of them."

"It all sounds goofy to me, believe I'd wait until *they* think of it."

"Can't see it that way. A man always thinks more of a raise when he knows its given as a reward for good work and can feel that he's appreciated. If he has to ask for more money he isn't sure whether the boss thinks he's doing a good job. Did you ever enjoy asking for a raise?"

"Money talks, Al—no matter what you have to do to get it—so long as its honest. I think, too, that you ought to know who are your best men without digging through that pack of cards."

"I'm not sure that I do, Ed. It's very easy to be influenced by the last job. Take a look at these cards turned in by Bill Kirchway. The last job didn't go so well—wife's been sick—but his previous record is fine. Bill gets a raise. If I hadn't looked these cards over I might have passed him up."

Should Al wait until wage increases are demanded? Is he wise in rewarding skill and effort that is producing results?

Discussion

How Interchangeable?

Interchangeable manufacture may be considered as accurate duplication of error, where error is in turn defined as deviation from theoretical dimension.

Permissible magnitude of error varies individually, being dually con-

trolled by functional design-demands and manufacturing economics.

When meeting any functional performance standard, fixed or variable, the true value of the notion of making all components to assemble without hand fitting or selection must economically attain a turning value when the whole cost of so doing equals the consequent *realizable* economy.

Enunciation of this principle is easy. Its application demands: first, careful analysis; second, exercise of excellent judgment.

—Roland V. Hutchinson.

Al is absolutely right in that good judgment is required in determining how far interchangeability should be carried.

I have worked as a designer in a plant which carried interchangeability to extremes. They made a world-famous product, but the high prices they could command by having a virtual monopoly of the market allowed them to carry the expense.

Interchangeability saves no assembly costs but increases manufacturing costs. These two charges must be watched to see that making does not cost more than saving.

As to replacements, it is necessary to remember that wear of one part may affect others, destroying the value of interchangeability, to wit, pairs of gears. If you change one you must change the other if you want them to run correctly and quietly.

Interchangeability has its value, sometimes a high value, but it is two edged and may cost more than it is worth unless carefully considered.

—D. L. Parkhurst,
Chief, Instrument Division,
U. S. Coast & Geodetic Survey.

There are cases where manufacturing costs must be increased to make components interchangable. When increased costs must be passed on to the customer some barrier against extremes must be erected.

As a glaring example, one manufacturer specifies that all female thread gages be of a length equal to the length of the thread on the part to be gaged. Most gages in this plant are two to three times as long as gages recommended by the National Screw Thread Commission. To machine such threads is costly and foolhardy.

Interchangeability is only practical when it can be attained by resorting to commercial tolerances.

—Ira S. Williams.

One Foreman

One foreman for both day and night shifts works well in the plant with which I am connected. When the scheme was first adopted, the foreman spent considerable time with the night men, but the management indicated that it did not consider that necessary. The foreman finally gained sufficient confidence in the night men to leave them more to themselves. Now practically the only form of communication between them is a diary in which the foreman enters each day the work to be done that night.

Al says his day men complained of having to do all the setting up for the night men. Surely machines are just as likely to need resetting at night as in day. If the men on the night shift are not sufficiently skilled to do the setting, all sorts of trouble can be anticipated. The men on the night shift should be the men requiring the least attention.

—E. N. Farrar,
Ipswich, Suffolk, England.

To the Lowest Bidder?

The practice of the United States Government and of many large corporations is to award contracts to the lowest bidders when quality and other conditions are equal. However, freak bids, even if lowest, are thrown out.

In the case in question it is obvious that the Buckley bid is a freak bid. It could be accepted as is, but experience has proved that it would be poor policy to do so. Not only is there danger that some reputable supplier would be discouraged, but there is the real danger of getting a poor bargain. Although Buckley bid with confidence, when it comes to delivery he will probably find out that his bid was too low. Rather than lose money he will then try to cut corners and get by with an inferior product. The result will be that he will break even or lose money and will be dissatisfied, and Al will get a poor fixture.

I would advise Al to go to Buckley and ask him to recheck his figures. If on doing so he is still satisfied, then Al is in position to insist on a first-class fixture.

—James K. Matter.

Not Naturalized

The fact that there are citizens without jobs who are not qualified for the position Al has to fill should not prevent him from hiring a foreigner. If the choice were between two men of equal skill and ability, one a citizen and the other not a citizen, I would favor the citizen.

It should be borne in mind that there are many native-born citizens who do not bother to exercise their citizenship and do not hold it in high regard. There is more excuse for a foreigner who perhaps does not realize the responsibilities and privileges of citizenship.

If Al had frankly told the alien who applied for the job his only objection to hiring him and inquired into his reason for not being naturalized, he might have found the man to be ignorant or afraid, and not at all unwilling. The showing of interest by the employer would probably result in confidence, which would certainly be more desirable than a "thumbs-down" attitude.

—Ralph J. Thompson.

Discrimination against unnaturalized persons is a display of ignorance. When the services of skilled workmen are in demand, sentiment, policy and rules must be forgotten.

A concern may have rules against employing aliens or men over 45 years of age, however capable they may be. But when orders are pressing, short deliveries demanded, idle machines in the shop and no help of the preferred class available, then there are but two courses open. Either only such volume of work must be taken as can be handled by the preferred class of men available, or else all the skilled men needed must be hired, regardless of whether they are aliens or men over 45 years of age.

If Al does not care to employ aliens, then he should not sell to them nor have any dealings with them. He should bottle himself up lest he become progressive. —W. E. Fischer.

Without question it would pay any concern to favor naturalized citizens against those who refuse to be naturalized. Very often a talk with alien workmen, giving them plainly to understand that lack of naturalization works against them will be instrumental in causing them to change their attitudes. No doubt there are cases where some fancied grievance, or possibly a real injustice, has caused the aliens to decide against naturalization. Whatever the facts of the case may be, it cannot possibly do any harm to discuss the matter with them openly and frankly.

—John E. Hyler,
R. G. Le Tourneau, Inc.

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Editorials

A Wagner Act for Employers

TO THE great relief of all concerned, the Supreme Court has finally ruled on the cases before it involving the National Labor Relations Act. A good many will find fault with the verdict but at least the uncertainty is over. Both employers and employees can come out of the fog of doubt that has been confusing them so long, and it is to be hoped that they will find a way of getting together.

Some sort of practical working arrangement is essential if we are to avoid chaos. Both sides in the old argument must be made to see that their stake in industrial success is equal, and that both go down if industry succumbs to government control and operation. An Australian industrialist of standing warns us not to force labor into politics as was done "down under." As a constructive force in industry labor has a place, as a dominating political party it has yet to prove a benefit to the country where it exists or to the men under its banner.

Although the Court says that the Wagner Act is constitutional it naturally refrains from comment on the wisdom or fairness of the law itself. To disinterested people familiar with its terms it is a one-sided measure, far less than fair in its approach to the labor question, and the Court action has not made it a bit better. After all that is a job for the legislators.

Voices have already been raised in Congress, and even in some parts of the administration, calling for amendment of the Wagner Act to make it less one-sided, or for passage of a companion law that will give to employers the protection they are denied in the existing law. Some such action must be taken sooner or later if we are to avoid having all industry taken over by the government.

IT IS obvious that there is a substantial faction in Washington that would like to push us over into the ranks of totalitarian states, but we do not believe that this group is yet the dominating one, nor that its proposal would meet with much favor in the country. Some idea of the attitude of the President toward the aims of this faction may be gathered from the sympathy he may express for a companion bill to protect employers. We fear that such a law is a long way off, but we are convinced that it will be enacted, if only to protect the new labor movement from its own inexperience and from the blunders of unseasoned leaders.

EXPORT STATISTICS

ACCORDING to the Bureau of Foreign & Domestic Commerce, machine tool exports in 1936 rose to practically $25,000,000, the highest record for the last ten years. With such a volume of business to figure on it is obvious that accuracy in the statistics is well worth striving for. Unfortunately, some doubt is being thrown on the value of this report because inaccuracies have been discovered in some of the allocations to specific classes.

Investigation has shown that most of the errors come from inaccurate or inadequate descriptions of the goods on the form known as the "shipper's declaration." It is from this form, of course, that the statistics are gathered. Most of the trouble seems to be in using the wrong class number as called for in the last column of the declaration.

Apparently the best way to improve the accuracy of the statistics is to have the export declaration filled out by some one thoroughly familiar with the equipment that is being shipped. Possibly this should be an engineer from the order department of the manufacturer, or else some one with corresponding familiarity with the product. At any rate it seems well worth while to urge manufacturers of all kinds of machinery to do their part in insuring accuracy in export statistics. Unless the kettle boils over in Europe the chances are that export trade in machinery is going to increase steadily during the next few years, and therefore the more we know about it statistically the better.

CHIPS

WASHINGTON

Farley observes with his usual geniality that Congress is being allowed to talk all it wants to about the proposal to pack the Supreme Court but that the votes are all lined up to put it through . . . Senate struggles to frame a resolution condemning sit-down strikes that will not hurt the feelings of the strikers or their bosses, evolves one that includes disapproval of labor spying and refusal to bargain . . . Hopkins refuses demand for higher W.P.A. wages . . . House gets cold feet and buries Dies resolution for investigation of sit-down strikes . . . Supreme Court holds Wagner Labor Relations Act constitutional in five cases, broadens interpretation of commerce clause in a way that is expected to be revolutionary . . . With labor law sustained legislators begin to discuss a corresponding law to protect employers . . . Robinson and Snell warn Congress that new tax sources will have to be discovered if spending is not curtailed . . . Relief expenditures likely to rise quarter million to three billion level despite re-employment in industry . . . Radio tax to be delayed . . . Wallace attacks Roberts as balance-of-power man in Supreme Court . . . Revenues for 1937 below expectations . . . Cut in C.C.C. and low-cost-housing projects probable . . . House passes 'Long and Short Haul' bill and anti-lynching measures.

FOREIGN

Italy charges French with supplying military leaders to Spanish Loyalist forces, Blum denies it and calls Italians liars in diplomatic language . . . British unions, disappointed at failure to get wage increases as result of defense program, plan serious strikes . . . Fascists snowed under in Belgian election . . . British food ships ordered not to try to run Insurgent blockade of Bilbao . . . Italy will fortify island close to African coast to block British on west end of Mediterranean, as well as on Red Sea where $4,000,000 is being spent on fortress . . . House of Commons refuses to censure Government for not breaking Bilbao blockade.

FINANCE

Senator King warns that federal deficit may reach upwards of $4,000,000,000 . . . Stock market cracks badly on Roosevelt's statement that steel and copper prices are too high, and on rumor that gold price will be changed . . . Federal Reserve supports U. S. bond market with heavy purchases.

INDUSTRY

Chrysler strike settled on terms generally similar to those arrived at in General Motors agreement and plants resume . . . Reo and Hudson strikers accept like terms . . . C.I.O. leaders threaten Ford who replies that he will never recognize any union . . . Irate Pennsylvania farmers and non-strikers drive sit-down strikers out of Hershey chocolate factory, send some to hospital, election to be held . . . Michigan Senate passes bills making sit-down strikes and dealings with sit-down strikers felonies . . . Final split between A.F. of L. and C.I.O. getting closer . . . Police use clubs to quell strike riot in New York engraving plant . . . Aluminum Company plans expansion costing $26,000,000 . . . Canadian premiers in Ontario and Quebec announce determination to keep American C.I.O. organizers from stirring up trouble . . . Rival lead miners' unions riot in Kansas . . . Labor leaders predict huge accessions as result of Wagner Act decision, look for end of industrial warfare . . . Tear gas routs strikers in Yale & Towne plant . . . . Lewis concedes that closed shop is his goal . . . Mayor of Oshawa calls upon U.A.W. for sympathy strike in U. S. General Motors but union leaders decide to keep out of Canadian strike situation and let local union handle it . . . A.F. of L. battles C.I.O. for supremacy in oil belt . . . Navy ships delayed from one month to year primarily because of shortage of material.

INDICATORS

Steel production practically at capacity . . . Electric power output rises . . . Business Week's index off half a point to 79.3.

Seventh Annual Economics Conference at Stevens Camp

The seventh annual Economics Conference for Engineers will be held concurrently with the summer session sponsored by the Society for Promotion of Engineering Education. This conference will be held at the Stevens Engineering Camp of Stevens Institute of Technology, at Johnsonburg, N. J., June 18-26.

The general evening sessions will include such speakers as John M. Carmody, administrator of the Rural Electrification Program, on "What Engineers Should Know About Labor Problems," W. H. Rastall, formerly chief of the Industrial Machinery Division of the Department of Commerce, on "The Effect of Government Policies on Engineering Industries," and A. R. Mathieson, assistant to the vice-president of the U. S. Steel Corporation, on "Industrial Relations."

Four courses are planned for the morning session. The group interested in industrial management will study such items as standards, planning, time and motion study, and wage methods. A course in industrial psychology led by Dr. R. S. Uhrbrock, The Proctor & Gamble Company, will cover job analysis, personnel selection, training of workers, accident prevention and incentives.

Further information may be obtained from President Harvey N. Davis, Stevens Institute.

American Standards Group Elects New Directors

Philip E. Bliss, president, Warner & Swasey Company, Cleveland, Leonard Peckitt, president, Warren Foundry & Pipe Company, and D. J. Kerr, assistant to the president and a director of the Lehigh Valley Railroad, are newly elected members of the board of directors of the American Standards Association. H. P. Charlesworth, assistant chief engineer, American Telephone & Telegraph Company, and J. Edgar Pew, vice-president, Sun Oil Company, Philadelphia, were re-elected.

Mr. Bliss was nominated for membership by the American Society of Mechanical Engineers, Mr. Kerr by the Association of American Railroads, Mr. Peckitt, by the Cast Iron Pipe Research Association, Mr. Pew by the American Petroleum Institute and Mr. Charlesworth by the American Institute of Electrical Engineers.

Complete Laboratory—New quarters and equipment expands research and testing facilities of the Timken Roller Bearing Co. This laboratory is equipped to operate on a 24-hour basis as many tests are run to destruction. Locomotive axles with bearings, complete automobile drives and bearings up to 24 in. O.D. are tested in special set-ups.

Production Clinic Formed

The Packaging Machinery Manufacturers Institute formed a production and engineering clinic at their semi-annual meeting held in New York. The clinic, under the chairmanship of Wallace D. Kimball, first vice - president, Standard - Knapp Corporation, was formed to consider problems of standardization and common interest and for the exchange of technical knowledge. To provide means for the continual exchange of information on engineering and production problems, the clinic voted to ask the Institute to sponsor and issue a monthly bulletin as a clearing house for industry information.

General Machinery Honors 50 Year Men

Thirteen employees of the General Machinery Co., Hamilton, Ohio, who have been with the firm more than 50 years were honored at a dinner attended by officers and employees of the company. George Rentschler, president, introduced Rear-Admiral Harold J. Bowen, United States Navy, who was the guest speaker and who praised the quality of diesel engines supplied to the navy by the firm. The thirteen men honored for their half century of service with the company were John Bachman, William Conlin, George Weickert, George C. Martin, John Haberman, Henry Shulte, E. Christ, J. W. McConnell, Thomas Hughes, John Horner, John Reiff, John Klingler, and John Kuhlman.

Great Lakes Exposition Offers New Attractions

"All New" is the watchword for this exposition which opens in Cleveland on May 29 and continues to Sept. 6. New attractions are expected to result in greater attendance than the 4,000,000 people of last year. To take care of visiting tourists, a "trailer city" combining all the best features of modern trailer camps will be established near the exposition.

"The Making of a Nation," occupying over 100,000 sq. ft. of floor space, will be the central exhibit feature. It will depict the social, agricultural and industrial growth and development of America in one collective exhibit of working models, raw material displays and twelve great murals by the famous artist, Juan Larrinage.

Tool Engineers Elect Officers

The American Society of Tool Engineers elected Frank A. Schuler, master mechanic, Highland Park Plant of the Chrysler Corp., national president. Luke E. Beach, assistant master mechanic, Packard Motor Car Co., and Walter Wagner, master mechanic, Lincoln Division, Ford Motor Co., were elected first and second vice-presidents respectively. C. Ray Brunner, of the tool engineering department, Dodge Brothers Corp., will continue as secretary and Frank R. Crone, tool engineer, Lincoln Division, was re-elected treasurer.

Russian Tools Improved by Government Supervision

According to I. M. Markoff, Chairman of the Machine Tool Commission of the U. S. S. R. in the United Kingdom, from 1930 when the Soviet Government approved a plan to develop a Russian machine tool industry, to February, 1937, the production of machine tools in Russian factories has increased from practically zero to 80 to 85 per cent of the total required. However, the general level of quality is not yet equal to that of the best American or European manufacture. Due to objections of the users, quality, material and workmanship are now emphasized, and in order to acquire these features an experimental plant in Moscow builds and tests the first models.

All new models must be approved by the Central Administration of the Machine Tool Building Industry before they may be put into production. This administration has eighteen machine tool plants at its disposal for building and tests, and a scientific research institute plans production of types according to national needs. To show the models which have been developed in the last two years the Third All-Union Machine Tool Building Exhibition will be held in Moscow this summer.

Railroads Purchase 70 Per Cent More Machinery

A recent survey by Railway Age indicates that approximately $3,390,000 worth of machinery and repair parts were purchased by all the railroads of the country in the year 1936. The total value of purchases by these same railroads during the year 1935 amounted to $1,961,058. The above figures do include expenditures for hand and small machine tools which for this year totaled over $6,000,000 alone.

Railway Supply Association Plans Exhibit June 16-23

Recent announcement by J. D. Conway, secretary - treasurer, The Railway Supply Manufacturers Association, Pittsburgh, indicates that the Municipal Auditorium, Atlantic City, will be completely filled for the exhibition of the Association which will be held at the same time as the annual meeting of the Mechanical Division of the Association of American Railroads. Exhibit space for buses, trucks and other forms of transportation and handling material devices will be provided.

American Machine Tools Still Lead in English Buying

A recent report covering the first two months trading in machine tools for the year 1937 indicates that the United States is still leading the field in exporting of machine tools to Great Britain. The total value in January and February of this year was £3,513,821 of which £1,719,155 represented the share which the United States had in the business. The nearest competitor was Germany with £842,546.

These figures indicate that the trend established in 1936 is continuing. According to American Trade Commissioner, Edward B. Lawson, London, the American machine tool builders supplied 58 per cent of the total machine tool imports of England for 1936. In this time, lathes were most in demand, followed by milling, grinding and drilling machines. American suppliers predominated in almost all classes, having sold 60 per cent of the value of lathes, 64 per cent of the milling machines, 71 per cent of the grinding machines, 70 per cent of the planing and shaping machines.

Tools to England Duty-Free

About 23 per cent of the machinery imported by public and private purchase in 1936 in England was granted duty-free entry under license, according to the president of the Board of Trade. The basis upon which such permits are issued is that "equipment was not obtainable for the time being in the United Kingdom." This fact has been successfully used by American builders during the past year as a regular procedure. In each case the importer must apply for a license for the individual shipment.

New Zealand Adopts 40-Hr. Week

The Socialist Government of New Zealand has adopted the 40-hr. week for all industries. The consequent decrease in output is expected to be made good by the installation of additional labor saving machinery of all kinds, and importers are having difficulty in meeting the demand.

Will Import American Tools

The Commonwealth Aircraft Corp., Pty., Ltd., Port Melbourne, will build a large factory for the manufacture of aircraft and engines. Operations are expected to begin on or about October 1. The corporation plans to import £150,000 worth of American machinery for the purpose.

Exports of Machinery During February, 1937

	February 1937	January 1937	February 1936
Electrical machinery and apparatus	$8,002,742	$7,471,528	$6,169,236
Power generating machinery (except automotive and electric)	1,096,333	1,200,987	630,555
Construction and conveying machinery	1,244,848	1,201,130	520,511
Mining, well and pumping machinery	3,587,507	4,565,500	2,780,007
Power-driven, metal-working machinery	4,061,919	4,314,629	3,834,019
Other metal-working machinery	308,228	270,877	471,815
Textile machinery	621,263	673,937	848,753

Exports of Metal-Working Machinery During February, 1937

	February 1937	January 1937	February 1936
Engine lathes	$146,661	$256,935	$395,476
Turret lathes	200,090	259,696	112,217
Other lathes	87,274	139,076	96,728
Vertical boring mills and chucking machines	147,938	164,765	232,506
Thread cutting and automatic screw machines	204,103	257,073	195,451
Knee and column type milling machines	242,861	221,431	111,952
Other milling machines	291,384	283,621	241,380
Gear cutting machines	313,436	106,925	255,368
Vertical drilling machines	69,751	249,315	76,674
Radial drilling machines	18,685	30,551	11,100
Other drilling machines	110,790	176,130	101,116
Planers and shapers	101,840	70,445	31,596
Surface grinding machines	106,208	115,276	109,422
External cylindrical grinding machines	61,422	101,257	131,362
Internal grinding machines	176,746	110,853	95,452
Tool grinding, cutter grinding and universal grinding machines	114,621	105,257	137,719
Other metal grinding machines	131,357	109,341	61,191
Sheet and plate metal working machines	521,314	408,185	215,842
Forging machinery	62,055	139,301	152,901
Rolling mill machinery	261,205	251,836	358,726
Foundry and molding equipment	101,891	147,571	349,218
Other power-driven metal-working machinery and parts	590,287	609,789	360,631
Other Metal-Working Machinery			
Pneumatic portable tools	85,102	118,503	55,745
Other portable and hand and foot operated metal working machines and parts	87,548	70,524	60,946
Chucks for machine tools	28,112	17,774	17,495
Milling cutters, machine operated threading dies and tape and similar machine-operated metal cutting tools	55,146	32,433	279,211
Other metal-working machine tools	52,320	31,643	58,418

WATCHING *Washington*

Wagner Act may embarrass unions . . . Sit-down strikes may inspire regulation . . . Court plan to be pushed . . . Federal receipts fall short of estimates . . . New taxes in prospect

WASHINGTON—Organized labor has succeeded in establishing the right of Congress to regulate labor relations. The Supreme Court's decisions on five test cases, supporting the validity of the Wagner Act, constitute a victory for union organizers, but in view of recent events this victory may prove to be a hollow one.

In fact the Wagner Act grants organized labor much less than it has already seized without the benefit of law in the series of C.I.O. sit-down strikes. It establishes collective bargaining by representatives of the majority of workers whereas C.I.O., with a minority in many plants, has insisted on speaking for all employees. So it may turn out that the Wagner Act is a limitation upon union activity rather than an aid.

Another angle is that the labor unions by insisting upon federal control over employee relations are also inviting federal control over themselves. Already expressions of censure against sit-downs have been proposed before Congress, and suggestions for trade union regulation by obligatory incorporation or other means have been revived. A few months ago such action before a Congress that is considered pro-labor would have seemed remote, but excesses invariably bring reaction and there is little doubt that the unwarranted and unlawful succession of strikes has outraged fair-minded legislators.

The way the law may operate is foreshadowed by the first appeal to it since the ruling by the Court. The International Merchant Marine invoked the Wagner Act to determine who were the labor leaders responsible for tying up the liner President Roosevelt by a sit-down strike. John M. Franklin, I.M.M. president, who petitioned the local Labor Board, stated: "We can truly say that in the speedy and satisfactory settlement of the strike the Wagner Labor Relations Act proved as beneficial to the employer as to the employee."

Significant also was John L. Lewis' warning that his C.I.O. unions would resist curbs commensurate with the responsibility which goes with labor's recently established rights in collective bargaining. Frankly asserting his objective of a closed shop for all industry, the C.I.O. leader scoffed at the idea that any legal restraints were needed to prevent organized labor from overreaching itself.

Reports that Presidential insistence on packing the Supreme Court would diminish in the face of favorable rulings on New Deal statutes seem to be unfounded. Administration members have long since dropped pretense as to the real motives underlying the proposed Supreme Court legislation. The aim is to change the Court's thinking on social legislation rather than to lighten the justices' labors.

Face-Saving Involved

Wage and farm regulation are still in the offing, and governmental leaders want to be sure that bills to their liking will stand the court test after they have become law. There is also a face-saving angle to the refusal of compromise in the court fight. Postmaster General Farley declared it "absurd" to think that a change in the court program had been rendered unnecessary; this statement was typical of administration comment following the President's decision to press the plan. There is a strong feeling that an administration reversal on this issue will seriously impair Presidential prestige.

By the time this comment is printed it is probable that the President will have delivered his message on relief. Meanwhile it has been admitted that the federal deficit would be "far greater than anticipated" unless there is an immediate curtailment of expenditures. A letter dated April 13 to the heads of executive departments and government agencies asked for surveys with the view to making substantial savings.

This action was inspired by the fact that receipts are less than anticipated. As was pointed out in these columns at the time (*AM*—Vol. 81, page 32h) the January budget message was hedged about by three large "ifs." One of these was the estimated increase in revenue of nearly one and a half billions during the fiscal year 1938. The railroad tax has not come in, the gift tax is away down, other taxes have not come up to estimates.

Revenues for the fiscal year ending June 30 will show revenues almost half a billion short of the official estimate made last January. Congressional and Treasury experts seeking new sources of federal income seem agreed that the little fellow and the middle class in the income brackets will bear the brunt of additional taxes if sufficient levies are to be raised. New taxes may increase the rates and lower personal exemptions on the tax affecting incomes ranging from $1,000 to $20,000. Another solution, the levying of a general sales tax, seems to find little acceptance by the administration.

Long Session

It is apparent that the present session of Congress will stretch longer than anyone anticipated when it convened in January—longer even than was anticipated when the Supreme Court proposal was made, on top of the reorganization plan for the government departments, commissions and bureaus.

Incidentally a great deal of delay in the Senate from now on may be traced to the desire to kill time on the part of three groups. Some Senators belong to one, some to two, and some to all three, but all three combined do not compose a majority. The first is those who are opposed to the enlargement of the Supreme Court. The second are those who for one reason or another are opposed to the changes in the government departments and bureaus which the President wishes, and the third is the group who do not want the long arm of the federal government interfering with their local policing in connection with the race question. — *Carter Field, Washington Bureau, McGraw-Hill Publishing Co.*

Japanese Machine Tool Trade Reflects Upward World Trend

Development of export trade in eastern hemisphere causes expansion of facilities and production of new tools within its boundaries

Labor statistics for 1935 recently published by the Commerce Office show that the total working hours of all Japanese plants in 1935 was 19.2 per cent higher than for the preceding year, although the average increase in other industries was only 10.9 per cent. The increase in labor wages paid by the machinery enterprises amounted to 15.6 per cent over that of the previous year. Figures indicate that the average wage paid amounted to approximately 6 cents per hour.

The Ebara Seisaku Sho, Tokyo-Meguro, has a record which is typical of Japan's thriving machinery enterprises. This company was founded in 1912 for the purpose of manufacturing pumps by the process patented by Professor Inokuchi. Since that time the list of products has increased to include water wheels, turbo-blowers, refrigerators, cooling equipment, gearing and crawler tractors. Since 1932 the capitalization of the company has been increased from 750,000 yen to 10 million yen, while the sales of the company rose from 1,672,000 yen to 5,696,000 yen.

The Nippon Seiko Kabushiki Kaisha, maker of the N.S.K. bearings, is considering the erection of a fourth factory. This new factory will be of such size as to add 50 per cent to the total capacity of the firm.

The Nippon Stainless Steel Company is using a new process for the making of stainless steel which was developed by Kiroku Higuchi. This steel is produced without the addition of nickel and is a low-carbon ferro-chrome in which the chromium amounts to about 13 per cent.

The Toyota Automobile Company plans to retool its Kariya plant with a total outlay of $1,200,000. American manufacturers are to get the orders for machine tools.

The Hitachi, Ltd., is inviting tenders for equipment for its diesel automobile manufacturing plant in Ibaraki.

The South Manchuria Railway Company plans to place orders for small direct-coupled diesel engines to haul construction materials. The purchases are to be made abroad due to a lack of capacity in the Japanese plants.

Japanese machinery deliveries to the Soviet Union in settlement of the Chinese Eastern Railway barter of 1935 are now almost completed. It appears, however, that the Soviet is inclined to continue placing orders on a cash basis. Negotiations are reported under way between trade representatives of Russia and several Japanese machinery makers for a number of paper manufacturing machines.

At the Showa plant now under construction in Chiba, American production methods will be adopted in the manufacture of high quality machine tools for the automotive industry.

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Industrial Review

• ALTHOUGH REPORTS from the various industrial centers indicate considerable unevenness in April business in machinery and machine tools there is little doubt that recent price increases have served to stimulate the placing of orders. Unwillingness of machinery manufacturers to quote firm prices for more than four months ahead has been an unsettled factor. Labor trouble has not afflicted the machinery building branch of the metal-working industry as yet.

• APRIL BUSINESS in the eastern territory is probably going to exceed March business by a considerable amount. The effect of price increases has been particularly strong in the area centering around New York, but it has also had its effect in New England and around Philadelphia. Pittsburgh business will at least equal that of March and may run ahead. Opinions of distributors in that territory differ. The same situation seems to exist in Cleveland where the month started off at a very high level and then disminished somewhat.

• INQUIRIES are abnormally active in Detroit and some business is being lost through inability to make deliveries. Plans for broad expansion by General Motors and Chrysler offer promise of good future business. Toledo reports a slackening in machine tool inquiry but is not particularly worried because there is still an enormous unsupplied demand for equipment in that region. April business in Cincinnati is expected to be much better than that of March and labor conditions are relatively good. Builders in that territory are oversold for months ahead.

• IN ST. LOUIS, strikes in the St. Louis Car Co. and the various electrical manufacturing companies have served to slow down April business and as a consequence the level is not expected to be up to that of March. Chicago distributors expect the exceptionally good volume in March to be equalled and perhaps exceeded. Milwaukee, on the other hand, finds a certain amount of slowing up which will bring the level for the month below that of previous months.

• PACIFIC COAST industry, entering April with no serious labor difficulties in any area, a condition which prevails for the first time in many months, looks for more business than in March. Orders of a few large coast concerns exert a strong influence on the picture of conditions within the machine tool business in this area, but although the railroads and some shipyards have completed buying, a few large orders are anticipated, which, plus other business, are expected to maintain well-above-normal demand.

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DAVID W. JENKINS, general sales manager, Henry Disston & Sons, Inc., has been appointed chairman of the Hardware Section of the Rotary International Convention to be held at Nice, France, beginning June 9.

H. B. LOXTERMAN, Blaw-Knox Co., Pittsburgh, has been elected president of the Dust Control Equipment Association. M. A. EIBEN, Northern Blower Co., Cleveland, and ARTHUR J. TUSCANY, Cleveland, have been elected vice-president and executive secretary-treasurer, respectively.

C. E. SULLIVAN has been appointed vice-president, Foxboro Co., Foxboro, Mass., manufacturers of industrial precision instruments. Mr Sullivan has occupied the position of Sales Manager of this company since 1920.

Detroit LETTER

Strikes move die business out of Detroit . . . Die union to tackle Fisher plant 23 . . .Wagner act may pave way for union into Ford . . . Chrysler approves Canadian expansion plan . . . General Motors plans 15 diesels daily

DETROIT—Strike talk still is in the automotive air but it has shifted from car manufacturers to the tool and die trade. Local shops have been badly hit by union agitation. It is estimated that work on '38 models valued at $1,500,000 already has gone outside of the state. Packard is reported to have awarded contracts to Philadelphia and Salem, Ohio, companies and Buick has given work to an Ohio concern. Fisher Body has placed a $300,000 order outside of Michigan. In at least one case the business was taken on a cost-plus basis.

Two factors are responsible for this trek of die work out of Detroit district. One is the high labor cost here compared with other cities and the other is the desire of the automobile industry to get away from this strike-infested area. The local tool and die trade has been in an uproar the past 10 days because of strikes and threatened strikes. Most aggressive trouble-maker has been the United Automobile Workers, which recently sent mimeographed letters containing a list of demands to all shops. The Mechanics Educational Society and its off-shoot, the Society of Tool and Die Craftsmen, have also been on the scene. It is believed that the U.A.W. has more tool and diemakers in its ranks than the other two combined, but the three together don't have a majority of the total workers, which number less than 10,000.

Want More Money

Negotiations between the shops and the U.A.W. progressed nicely on all points except rates of pay, which the former considered exorbitant. To try to enforce its pay demands, the U.A.W. called sitdowns at Richard Brothers and Koestlin Tool & Die, probably the two largest Detroit shops. At a meeting of its members from the tool and die trade on Friday night, the U.A.W. voted against a general strike. At one plant a union committee has asked for a flat increase of 20 cents an hour for every man in the shop, regardless of his job, but there is slight chance that this demand will be met. During the tool and die strike of 1934, the M.E.S. had little luck with the captive shops. Now the U.A.W. is turning its attention to such shops, having begun by making demands on Fisher plant 23 in Detroit, Fisher's largest and most important die plant. Incidentally the union emphasizes that the General Motors agreement contains nothing forbidding a strike at plant 23 if that should become advisable.

"Quickie" Strikes and "Slowdowns"

Threats of "quickie" sitdowns continue to hang over G.M. plants and the slowdown technique has been used more than once, principally at Chevrolet in Flint and at Ternstedt, in Detroit. Packard is considering a list of 22 demands made by the U.A.W. and may be the first motor plant where the Wagner act is invoked to hold an election to determine whether the U. A. W. shall be the spokesmen for all employes. The union claims it has a comfortable majority of Packard's workers in its ranks. The only company which appears to be able to defend itself successfully against union invasion is Ford. The U.A.W. claims only several thousand members at Dearborn and has no intention of trying to precipitate trouble there until it is sure it has a majority of Ford's employees. Homer Martin, union president, believes the Wagner decision of the Supreme Court opens the way to union recognition by Ford without a strike, but that remains to be seen.

DETROIT, APRIL 19—General Motors shortly will begin an expansion program in its parts and accessories manufacturing divisions. It is designed to give the corporation additional production capacity and to decentralize further its operations as a protection against labor stoppages. Inland Mfg. Co. will build a branch plant in the East and Delco-Remy activities at Anderson, Ind., will be augmented. Plans call for enlarged manufacturing facilities at Rochester and Syracuse. This extensive program should involve sizable expenditures for equipment.

Chrysler Changes Program

The Chrysler management has just given the "go ahead" on the expansion program at its Canadian Division where three million dollars will be sent to equip an engine plant, including cylinder block, crankshaft, camshaft, connecting rod and piston departments. Plymouth has bought some machinery to raise its machining capacity on its motor. The Jefferson Avenue plant of Chrysler has been purchasing machine tools for the past month or longer to step up its engine-building capacity. Chrysler has taken quotations on machinery for a new transmission department, presumably to be located outside Michigan. There is talk that Chrysler's next move will be to put an assembly plant in the East to serve the rich eastern market. An idle plant in Philadelphia is said to be under consideration.

General Motors is beginning to make purchases of equipment for its diesel engine factory which will be tooled up to make 15 to 20 units a day. As previously reported, the plant will build three-cylinder, four-cylinder and six-cylinder engines and will be in Detroit. Packard has been quietly expanding production of its One Twenty and six by purchasing machinery duplicating that already in its plant. Chevrolet still is placing orders for its new Buffalo plant, its machine tool buying alone mounting to several million dollars. It hopes to have the plant in operation by October, although it officially puts Jan. 1 as the opening date. Later on it may add a forge shop there. Both Buick and Pontiac are proceeding with their expansion programs.

Ford is buying equipment for its new combined tool and die department at the Rouge plant.

Carl B. Auel Was Westinghouse Industrial Relations Expert

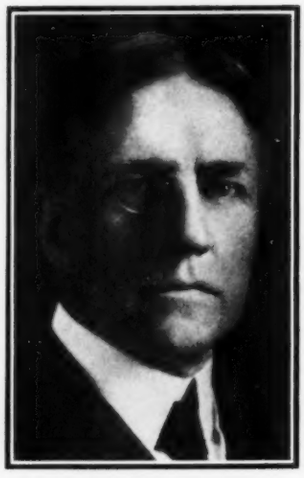
Carl B. Auel, industrial relations and safety expert, died April 4, at his home at Irwin, Pa., at the age of 67. After graduation from Cornell University, Mr. Auel was employed by the Westinghouse Electric & Mfg. Co. He became in turn manager of production, assistant works manager, director of standardization process and manager of employees' activities. At the time of his death he was industrial relations manager for the company.

During his years of service with the company, he began a building and loan association, founded a tuberculosis sanatorium and developed a medical service for employees. He was also in charge of the pension system. Mr. Auel was a past president of the National Safety Council and held a number of executive positions with the American Society of Mechanical Engineers.

March Tool Sales Up

A good recovery in machine tool orders made March the best month of the new year. The increase was primarily due to increases in the domestic volume as foreign orders were less than for the previous month. It will be noted that the business for the first quarter of this year was double that of the 1936 first quarter. The distribution of orders shows further improvement in the position of the individual companies reporting.

Relations Manager



CARL B. AUEL

OBITUARIES

WADDELL P. ANDRUS, chairman of the Board of Directors, High Speed Hammer Co., Rochester, N. Y., died recently at the age of 70 of cerebral hemorrhage. He purchased an interest in the High Speed Hammer Company eighteen years ago, becoming its principal owner five years later.

JOHN D. COMSTOCK, 72, advertising manager of the P & F Corbin Division of the American Hardware Corporation, died March 30, following an illness of several weeks.

PAUL W. DIETER, president of the Dieter Bearings Corp. and the Standard Safety Nut Corp., died April 5 in New York at the age of 53. Mr. Dieter had been in the railroad supply business for about 30 years, having patented the Dieter bearing, a journal bearing for locomotives and cars, and devised various forms of lock nuts.

Kelly Reamer President

HORACE C. PUTNAM

HORACE C. PUTNAM died at his home in Cleveland on March 21, at the age of 64, after suffering ill health for about one year. He formerly was district sales manager in Cleveland for the American manufacturing concern of Falconer, N. Y. In 1919 he became financially interested in The Kelly Reamer Co. and in 1920 was elected president and served in this office until the time of his death.

GEORGE SIEBER, 61, vice-president of the Frankham Brass & Bronze Co., Canton, Ohio, died recently following a long illness.

RUSSELL D. WELLS, president of the Floyd Wells Stove Co., Royersford, Pa., and head of the Manufacturers' Protective and Development Association, died on April 7 in Philadelphia at the age of 50 following a brief illness.

Horace S. Wilkinson, chairman of the Crucible Steel Co., of America, died April 11 of coronary thrombosis and myiocarditis at the age of 68. He organized the Halcomb Steel Co., Syracuse, and gained control of the Sanderson Steel Co., in the same city. Mr. Wilkinson later assisted in the reorganization of the Crucible Steel Co. The merger of these three companies re-established the position of the crucible process in this country and today the company is regarded as one of the six largest independent steel companies in the United States. Mr. Wilkinson had been chairman of the board since 1919.

Index of Machine Tool Orders

Based on Volume of Shipments for 1936

Month	Index of Orders: Domestic	Foreign	Total	3 Months' Average Index	% Foreign to Total Orders
1936 — April	110.9	14.8	125.7	114.4	12
May	95.7	23.2	118.9	116.6	19
June	106.5	22.3	128.8	124.4	17
July	104.4	45.7	150.1	132.6	30
August	96.1	31.4	127.5	135.5	24
September	82.9	35.6	118.5	132.0	30
October	105.4	31.1	136.5	127.5	23
November	110.7	36.4	147.1	134.0	25
December	205.7	52.0	257.7	180.4	20
1937 — January	156.1	44.0	200.3	201.7	22
February	122.4	42.8	165.2	207.7	26
March	172.1	39.5	211.6	192.4	18

Distribution of Orders

Average Indexes of Individual Companies Based on 1926 Level of Business	Companies in Per Cent of Total Number Reporting: 1936 2nd Quar.	1936 3rd Quar.	1936 4th Quar.	1937 Jan.	1937 Feb.	1937 March
200-up	17.2	15.8	28.4	35.1%	24.4%	35.0
100–199	32.6	28.8	30.2	30.6	33.6	34.3
60– 99	19.0	22.9	19.5	14.2	21.4	13.9
20– 59	21.8	21.7	15.2	13.4	12.2	11.0
Less than 20%	9.7	10.8	6.7	6.7	8.4	5.8

PERSONALS

C. L. CAMPBELL, Cadillac Machinery Co., Detroit, will leave for Europe on the Ile de France, April 20. He will be there approximately six weeks during which time he will visit England, France, Germany and Italy from where he will return on the Rex.

MALCOLM CLARK was elected president and general manager of the Federal Machine & Welder Co., of Warren, Ohio. He formerly occupied a position with the Taylor-Winfield Corp. as general manager and a director. Mr. Clark is also treasurer of the Frontier Products Co., of Mineral Ridge, Ohio. He now holds about fifteen patents pertaining to welding which are utilized in the iron and steel industry.

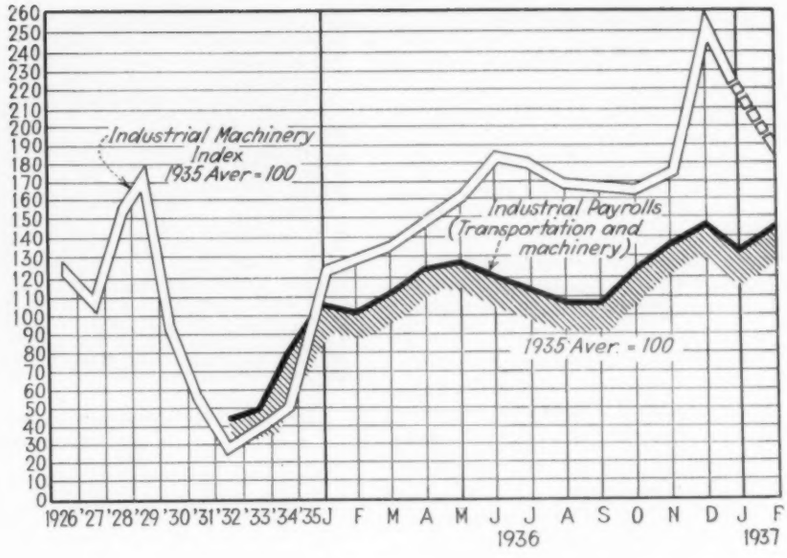
MAXWELL A. COE, vice president of the Stanley Works, New Britain, and NOAH LUCAS, president of the Savings Bank of New Britain, have been elected directors of the Skinner Chuck Company.

C. J. DUBY has been named Chief Engineer of the Youngstown-Warren Districts of the Republic Steel Corp. Mr. Duby has been chief engineer of the Warren District of the Republic Steel Corp. for the past six years.

JOHN J. JACKSON, who served for 21 years as vice-president of the Pittsburgh Gear & Machine Co., J. HARPER JACKSON, who had been with the same company since 1919 as secretary and sales manager, and STANLEY J. JACKSON, who had been in charge of production for the same company, have organized the Jackson Gear Co., Pittsburgh, Pa. The company plans to manufacture a complete line of gears for industrial use.

HARRY A. KRAELING has become vice-president and general manager of the Pittsburgh Gear & Machine Co. Mr. Kraeling was formerly of the Standard Steel Propeller Co., Homestead, Pa., and is well known in the steel industry through his long affiliation with leading chemical, radium and ferro alloy producers. HENRY E. REA has been named secretary and sales manager of the company. FRANK REA, founder of the company, will continue as president.

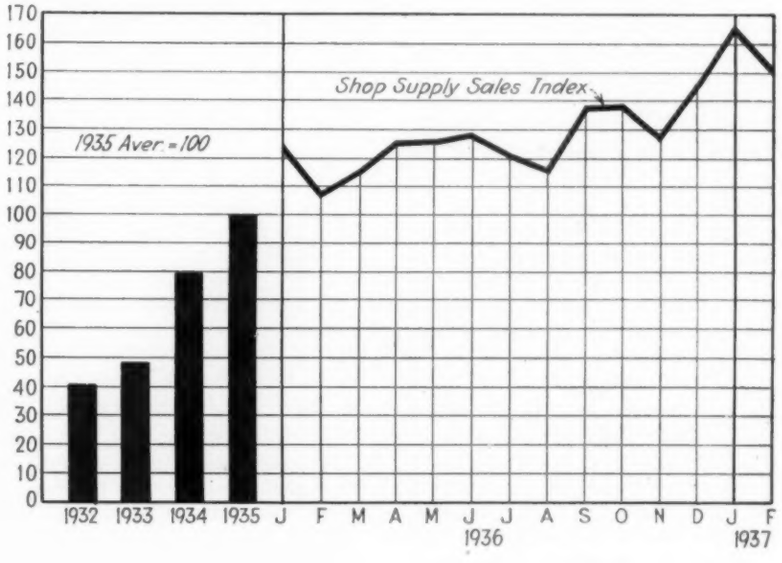
D. E. VAN DEUSEN has been elected president and general manager of The Kelly Reamer Co., Cleveland. M. A. PUTNAM and JOHN M. DAVIS have been elected vice-president and secretary-treasurer, respectively.


Industrial Machinery Index 1935 Aver.=100
Industrial Payrolls (Transportation and machinery)
1935 Aver. = 100
1926 '27 '28 '29 '30 '31 '32 '33 '34 '35 J F M A M J J A S O N D J F
1936
1937

February Industrial Machinery Index Takes Another Drop

More evidence that December was a very abnormal month for industrial machinery orders came to light when the first February reports came in. From a final figure of 224 for January there was a further dip to a preliminary estimate of 192. This looks like quite a recession, but after all it still leaves the index at a point higher than was reached in any month in 1936 except December.

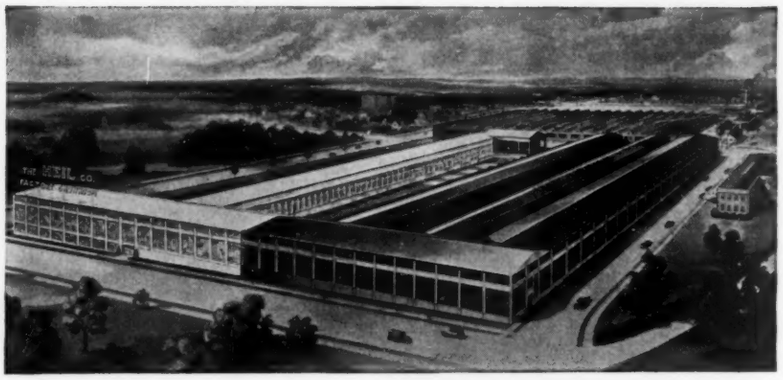
For comparison we have plotted the industrial payroll index of the Bureau of Labor Statistics to the same 1935 base. It rose rapidly for four months and has been practically stationary since November.



Index of Shop Supply Sales Receded in February

The year end rise in the Index of Shop Supply Sales ended in January with a high of 164.5. A 14-point drop occurred in February, bringing it to 150.7.

BUSINESS ITEMS



The light-toned buildings to the left show the new addition to the main works and general offices of The Heil Co.

Aerotorque Engine Co., New Haven, Conn., has incorporated and the Aerotorque Co., and the Aerotorque Drive & Power Co., are still in the process of formation. These three companies will engage in the development of power transmission for heavy-duty service, particularly where stability and strength for excessive loads is essential. GEORGE PARMLY DAY, treasurer of Yale University, is president. ELIAS ORSHANSKY is designer. TILDEN W. SOUTHWACK, EDWARD D. JACKSON and EDWARD C. ROBERTS are associated with this project.

The Allegheny Steel Company will add 3,000 tons a month to its capacity by the installation of a 25-ton electric melting furnace for the production of specialty steels.

The Aluminum Company of America has announced an expansion program for 1937 which will involve the total expenditure of $26,000,000 in various localities. ARTHUR V. DAVIS, chairman of the board, announced that a large plant would be built immediately at Lafayette, Ind., for the manufacture of extruded shapes and tubings.

The American Foundry Equipment Co., Mishawaka, Ind., has appointed CHARLES RUTLEDGE as service representative in the Detroit district.

The Bodine Electric Company announces the appointment of H. M. HALL, 108 West Sixth St., Los Angeles, as its representative for the Southern portion of the state. J. A. NADON will represent the company only in the northern portion of the state.

Carboloy Co., Inc., Detroit, announces that P. H. HOLTON has been added to the sales engineering personnel of the Philadelphia territory.

Circle Tool & Die Corp., Detroit, has been formed by MICHAEL MUNER for the manufacture of tools.

The Driver-Harris Co., Harrison, N. J., announce that H. O. HARTDEGEN is sales engineer for the northern New York and eastern Pennsylvania territory. J. B. SHELBY will act as co-manager of the Foundry Division with J. SAMMON.

Ex-Cell-O Aircraft & Tool Corp., Detroit, announced that GEORGE SCOTT has joined the Sales Promotion Department.

The General Electric Co., is sponsoring a traveling show presenting the latest electric equipment for machine tool application and stressing the importance of higher production speeds with greater accuracy. The Carboloy Co., Inc., will also assist in the presentation. The show will be in Worcester, Mass., May 17; in Cincinnati, May 24; and in Rockford, Ill., May 28. The company has also opened an exhibit of electrical products for industry in the General Electric Building, 570 Lexington Ave., New York. It is expected that this exhibit will be open for several months and is to include a complete line of representative products of the company and its affiliates.

Four Wheel Drive Auto Co., Clintonville, Wis., and Kitchener, Ont., is purchasing $100,000 worth of new equipment with which to supply a new heat-treating department, new lathes, gear cutting machinery, and other production equipment.

The Heil Co., Milwaukee, Wis., announces the construction of an addition to their factory which will be completed and ready for manufacturing operations by June 1.

The Hannifin Manufacturing Co., Chicago, has purchased the machinery, equipment and name of John F. Allen Co., New York, makers of air operated riveting machines. Manufacture, sales and service of Allen riveting machines will be continued as the Allen Riveter Works, Division of Hannifin Manufacturing Co., at St. Marys, Ohio.

LeMaire Tool Mfg. Co., Dearborn, Michigan, has begun a program of plant expansion which is to cost about $70,000. Of this amount some $40,000 is to be spent for equipment.

The Lincoln Electric Co., Cleveland, announce the appointment of DON MCCORMICK as arc welding consultant for the Kansas City, Missouri, office. Mr. McCormick was formerly welding supervisor for the Sheffield Steel Co. of Kansas City.

The Linde Air Products Co., unit of Union Carbide & Carbon Corp., announce the opening of a new Prest-O-Lite acetylene plant at Norfolk, Virginia, and a new Linde oxygen plant at Essington, Pa.

Machine Products Corp., Detroit, has been established by EDWARD J. SWINK to manufacture tools and dies.

The McAleer Mfg. Co., Detroit, Mich., producers of compounds for buffing of metals and finishes, announces the appointment of the Crown Rheostat and Supply Co., Chicago, as an exclusive distributor of their products.

The Mill Development Corp., Childs, Md., has been incorporated by EDWARD P. FRANKE and ROGER B. WILLIAMS, Baltimore, and J. FRED CRANE, Childs, to deal in machinery and plants.

The Oesterlein Machine Co., Cincinnati, has been reorganized under the direction of CHARLES D. OESTERLEIN and other former employees of the company. The company is prepared to give prompt attention to replacement parts orders for their Tilted Rotary and Tilted Offset Millers, and will continue the development of those lines of millers.

The Timken Roller Bearing Co., has appointed the following men as district managers in charge of steel sales for the Steel and Tube Division: W. F. ANDERSON, St. Louis; M. C. BELLAMY, Seattle; G. W. CURTIS, Milwaukee; H. V. FLEMING, Birmingham; B. E. KEIFER, Cincinnati; H. D. ROBB, Pittsburgh; B. M. TINLIN, Huntington.

White Motor Co., Cleveland, is planning an expansion program for the next 18 months which will involve an expenditure of $2,000,000, three-quarters of which will be spent for tools.

Ship Shortage May Affect U. S. Machinery Exports

Demand for charter ships has reached a momentum almost equal to that of 1918 and has doubled in the past year. If the tonnage market continues to grow at its present rate, U. S. exporters and perhaps importers will experience costly delays, if not some degree of distress. Today this shortage is felt only in spots. New York, for example, is now in a ship-owners' market for space for cars and trucks, machinery and the entire group of manufactures for South Africa. Spot orders aggravate the shortage of space. All of this may affect adversely the export of machine tools to foreign countries which has, for the past year, shown considerable increase and which amounts to approximately 25 per cent of the machine tool business of this country.

EXPORT OPPORTUNITIES

S. L. Lazarect, Lukes Electrical Motor Service & Machinery, Ltd., 324 Notre Dame Ave., Winnipeg, Manitoba, is in the market for six machine shop lathes (up to six foot), three drills, and four shapers.

References concerning the following commission agents and importers can be obtained from the Business Publishers International Corporation, 330 West 42nd St., New York, N. Y.

Simon, Leisse & Cia., Garay 737, Buenos Aires, Argentina, is interested in industrial machinery, mining and petroleum equipment, and covers all of the territory of Argentina.

Brander & Cia., Tacuari 318, Buenos Aires, Argentina, represent American manufacturers, and are interested in public works construction equipment and industrial machinery.

Pedro L. Alvarez & Hno., Apartado de Correos 147, Manzanillo, Cuba state that one of their subscribers is interested in materials of construction, foundry and industrial shop equipment.

Emilio Haas & Cia. Ltda., Casilla 2658, Santiago, Chile, who operate in the city of Santiago and the southern part of Chile are interested in industrial machinery and maintenance equipment.

James Magnus & Cia., 96 Rua S. Pedro, Rio de Janeiro, Brazil, are interested in catalogs and prices on machine shop equipment.

E. Castaneda, Calle de Tapia 1714, Pte., Monterrey, N. L., Mexico, is inquiring for machinery for producing bolt heads on machine screws ranging in size from ¼ in. to ⅞ in. in diameter and also for equipment for welding chains.

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* Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office. Please refer to key number.

Battery-manufacturing machinery, and machines to manufacture lighting sets. (Purchase.) Bombay, India. *2974.

Crushers, gyratory, for crushing iron ore. (Purchase.) Stockholm, Sweden. *2949.

Electric fan manufacturing machinery. (Purchase.) Calcutta, India. *2947.

Machine tools. (Agency.) Paris, France. *2943.

Machine tools and workshop machinery (Agency.) Brussells. *2973.

Paper bag manufacturing machinery and shopping bag stitching and sealing machines. (Purchase.) Bogota, Colombia. *2945.

Rayon manufacturing (modern process) machinery (Purchase.) Charleroi, Belgium. *2946.

Steel plant equipment. (Agency.) Paris, France. *2972.

Textile machinery. (Agency.) Leicester, England. *2950.

MEETINGS

Refrigerating Machinery Association. Spring Meeting. Hot Springs, Va. May 12–13. J. M. Fernald, president, Southern Bldg., Washington, D. C.

American Electro-Platers' Society. Twenty-fifth Annual Convention. June 14-17. Hotel Pennsylvania, New York. Henry A. Painter, secretary, Berkley Blvd., Iselin, N. J.

American Foundrymen's Association. Annual convention and exhibit, Milwaukee Auditorium, Milwaukee. May 3-7.

American Gear Manufacturers Association. 21st Annual meeting, Galen Hall Hotel, Wernersville, Pa. May 24-25 J. C. McQuiston, manager-secretary, Penn Lincoln Hotel, Wilkinsburg, Pa.

American Institute of Electrical Engineers. Summer Convention. Milwaukee, Wis. June 21-25. H. H. Henline, secretary, 33 West 39th St., New York, N. Y.

American Society of Mechanical Engineers. Semi-annual meeting. May 17-21. Statler Hotel, Detroit. C. E. Davies, secretary, 29 W. 39th St., New York.

American Society for Testing Materials. Annual meeting and exhibit of testing apparatus and related equipment. Waldorf-Astoria Hotel, New York. June 28-July 2.

Association of American Railroads, Mechanical Division. Annual meeting, Municipal Auditorium, Atlantic City. June 16-23.

Chamber of Commerce of the United States. Twenty-fifth anniversary meeting. Washington, D. C. April 26-29. D. A. Skinner, secretary.

Economics Conference for Engineers. Seventh Annual Convention. Stevens Engineering Camp, Johnsonburg, Warren County, N. J. June 18-26. President Harvey N. Davis, Stevens Institute of Technology, Hoboken, N. J.

National Association of Purchasing Agents. "Informers-A-Show." May 24-27. William Penn Hotel, Pittsburgh. G. A. Renard, secretary, 11 Park Place, New York.

Railway Supply Manufacturers Association. Exhibit and meeting in connection with Association of American Railroads, Mechanical Division. Municipal Auditorium, Atlantic City. June 16-23. J. D. Conway, secretary-treasurer, 1941 Oliver Bldg., Pittsburgh, Pa.

Air Conditioning Manufacturers' Association. Annual Meeting. Hot Springs, Va. May 14–15. J. F. G. Miller, president, 915 Southern Bldg., Washington, D. C.

Society of Automotive Engineers. Summer meeting. The Greenbrier, White Sulphur Springs, W. Va. May 4-9. John A. C. Warner, secretary, 29 West 39th St., New York.

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Schafer Metals Co., Curtis Bay, Baltimore, has changed its name that of Maryland Metals Co.

Worthington Pump & Machinery Corp. is arranging for the reopening of their plant at Holyoke, Mass.

Cherry-Burrel Corp., Baltimore, will enlarge its present production facilities.

National Can Co., Inc., Baltimore, will add approximately 27,000 sq.ft. of floor space to their plant.

PATENTS

March 23, 1937

Metal-Working Machinery

Sheet Handling and Feeding Apparatus. Victor T. Grover, Irvington, N. J., assigned to American Can Co., New York, N. Y. Patent 2,074,330.

Armature Assembling Machine. Edward W. Collins, Lora E. Poole and Charles A. Nichols, Anderson, Ind., assigned to General Motors Corp., Detroit, Mich. Patent 2,074,366.

Boring Machine. Lora E. Poole, Anderson, Ind., assigned to General Motors Corp., Detroit, Mich. Patent 2,074,426.

Screw Cutting Machine (Tapping). Richard Herrmann, Stuttgart, Germany. Patent 2,074,470.

Open Die Upsetting Machine. Richard Lester Wilcox, Waterbury, Conn., assigned to The Waterbury Farrel Foundry and Machine Co., Waterbury, Conn. Patent 2,074,679.

Upsetting Machine. Richard Lester Wilcox, Waterbury, Conn., assigned to The Waterbury Farrel Foundry and Machine Co., Waterbury, Conn. Patent 2,074,680.

Method and Apparatus for Transforming Bendable Material Into Predetermined and Finished Shapes. Durward K. Hopkins, Peoria, Ill., assigned to Keystone Steel & Wire Co., Peoria, Ill. Patent 2,074,789.

Apparatus for Coating Sheet Metal. James R. McElhaney and Robert Stoker, Vandergrift, Pa., assigned to American Sheet and Tin Plate Co., New Jersey. Patent 2,074,798.

Chucking Machine. Donald H. Montgomery, West Hartford, and Robert C. Nelson, Kensington, Conn., assigned to The New Britain Machine Co., New Britain, Conn. Patent 2,074,933.

Casting Machine (Pressure). Leopold Frommer, Berlin-Zehlendorf, Germany, and Josef Polak, Prague, Czechoslovakia, assigned to Transforma Aktiengesellschaft, Vaduz, Liechtenstein. Patent 2,074,984.

Parts and Mechanisms

Gear Drive and Flexible Rollable Belt. George Holt Fraser, Brooklyn, N. Y. Patent 2,074,328.

Hydraulic Coupling. Harold Sinclair, Surbiton Hill, England. Patent 2,074,346.

Fluid Pressure Actuated Motor. Herbert C. Bowen, Detroit, Mich., assigned to Hydraulic Brake Co., Detroit, Mich. Patent 2,074,362.

Impedance Variation Amplifier. Wilfred H. Howe, Winchester, Mass., assigned to The Cincinnati Milling Machine Co., Cincinnati, Ohio. Patent 2,074,396.

Pouring Spout Adapted for Use With Centrifugal Casting Machines. Louis A. Camerota, Burlington, N. J., assigned to Florence Pipe Foundry & Machine Co. Patent 2,074,537.

Hydraulic Power Transmitting Mechanism. Emil Golz, Stuttgart-Degerloch, Germany. Patent 2,074,583.

Conveyor Driving Control (Electroplating). Guerin Todd, Matawan, N. J., assigned to Hanson-Van Winkle-Munning Co., Matawan, N. J. Patent 2,074,599.

Expansible Nut Unable to Work Loose. Maurice Bourdon de Launay, Le Quillio, France. Patent 2,074,779.

Friction Drive Mechanism. Anton C. Schmelzer, Cleveland. Patent 2,074,868.

Machine Tool Feeding Mechanism (Lathe). William G. Hoelscher, Norwood, Ohio, assigned to The American Tool Works Co., Cincinnati, Ohio. Patent 2,074,961.

Speed Change Device. Frederick W. Faltermayer, Philadelphia, Pa. Patent 2,074,997.

Processes

Means and Methods for Making Nuts. Richard Lester Wilcox, Waterbury, Conn., assigned to The Waterbury Farrel Foundry and Machine Co., Waterbury, Conn. Patent 2,074,678.

Method of Tinning and Tinned Articles. Frank M. Levy, Port Huron, Mich., assigned to Mueller Brass Co., Port Huron, Mich. Patent 2,074,848.

Tools and Attachments

Vibrometer. Thorsten Y. Olsen, Philadelphia, Pa. Patent 2,074,417.

Boring and Facing Tool Head. Charles B. Cole, Berwyn, and Otto L. Lewis, Chicago, Ill.

Grease Gun. Neil V. Smith and Carl W. Stoll, Los Angeles, Calif., assigned to Smith-Johnson Corp., Los Angeles, Calif. Patent 2,074,570.

Boring Tool. Johannes Eggemann, Holm, Germany. Patent 2,074,605.

Adaptable Electric Hand Tool. Harry A. Ungar, Los Angeles, Calif. Patent 2,074,629.

Wheel Puller. Herbert Herkimer, New York, N. Y., assigned to Servicemen Supply Co., New York, N. Y. Patent 2,074,649.

Metalworking Machine (Milling Attachment For Lathes). Charles H. Hill, Trousdale, Kans., assigned to The Master Brake and Appliance Co., Inc., Trousdale, Kans. Patent 2,074,844.

Industrial Truck. Frank Stoner, Lakewood, Ohio, assigned to The Baker-Raulang Co., Cleveland, Ohio. Patent 2,074,946.

Location Tool (For Centering Spindles). David A. Roberts, Flint, Mich. Patent 2,074,990.

March 30, 1937

Metal-Working Machinery

Method of and Machine for Grinding or Lapping Bearing Rolls. Alvin B. Einig, Cleveland Heights, Ohio, assigned to The Motch & Merryweather Machinery Co., Cleveland, O. Patent 2,075,104.

Resistance Welding Apparatus. Gerhard P. Lessmann, Forest Hills, Wilkinsburg, Pa., assigned to Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Patent 2,075,121.

Wire Forming Machine. David L. Brown, Summit, N. J., assigned to Trussell Manufacturing Co., Poughkeepsie, N. Y. Patent 2,075,168.

Valve Seat Lapping Machine. Victor Mancuso, Los Angeles, Calif., assigned to Axelson Manufacturing Co., Los Angeles, Calif. Patent 2,075,216.

Extruding Machine. Edgar N. Meakin, San Francisco, Calif. Patent 2,075,450.

Machine for Molding Plastic Substances. Albert William Sizer, Heasle, Kingston-upon-Hull, England. Patent 2,075,476.

Cutting Machine (Gears). Homer C. Warner and Charles H. Schurr, Cleveland, Ohio, assigned to The Lees-Bradner Co., Cleveland, Ohio. Patent 2,075,489.

Extrusion Press with Electrically Heated Container. Hermann Nehlsen, Dusseldorf, Germany, assigned to Schloemann Aktiengesellschaft, Dusseldorff, Germany. Patent 2,075,622.

Sandblast Apparatus. Emile Lauffer, Liege, Belgium. Patent 2,075,732.

Continuous Method of and Apparatus for Making Plastic Products. Evarts G. Loomis, Newark, N. J. Patent 2,075,735.

Parts and Mechanisms

Pump and Method of Silencing and Operating Pumps. Elek Benedek, Mount Gilead, Ohio. Patent 2,075,017.

Work Support for Riveting Machines. Arthur R. Havener, Wayland, Mass., assigned to Judson L. Thomson Mfg. Co., Waltham, Mass. Patent 2,075,113.

Rivet Setting Device. Ross H. Begg, North Haledon, N. J., assigned to Breeze Corp., Inc., Newark, N. J. Patent 2,075,162.

Speed Change Mechanism for Screw Machines. Herbert E. Tautz, Milwaukee, Wis. Patent 2,075,240.

Power Transmission. Charles J. Anderson, Jr., Jamestown, N. Y. Patent 2,075,418.

Coupling. George Harold Thomas, Erie, Pa. Patent 2,075,481.

Processes

Method of Making a Bearing Material. Roland P. Koehring, Dayton, Ohio, assigned to General Motors Corp., Detroit, Mich. Patent 2,075,444.

Art of Surfacing One Metal With Another. Frederick Gettelman, Milwaukee, Wis. Patent 2,075,518.

Zinc Plating. Floyd F. Oplinger, Niagara Falls, N. Y., assigned to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Patent 2,075,623.

Tools and Attachments

Degree Plate. Carl N. Damm and Adam Pyle, Sr., Muskegon Heights, Mich., assigned to Pyle Pattern & Mfg. Co., Muskegon Heights, Mich.

Chuck Device. George W. Emrick, Brooklyn, N. Y. Patent 2,075,031.

Soldering Iron and Accessories. Harold B. Ring, Brooklyn, N. Y. Patent 2,075,227.

Hole Lapping Tool. Orie C. Kommer, Muskegon Heights, Mich. Patent 2,075,397.

Transforming Die. Benjamin Burvenick, Richmond Hill, N. Y., assigned to Lalance & Grossjean Corp., New York, N. Y. Patent 2,075,637.

April 6, 1937

Metal-Working Machinery

Horizontal Extrusion Press. Richard W. Dinzl, Narberth, and John C. Graf, Philadelphia, Pa., assigned to Baldwin-Southwark Corp., Del. Patent 2,075,803.

Production of Compact Molded Bodies from Ceramic Masses, Concrete or the Like (Hydraulic Press). Elisabeth Lux, Dusseldorf-Heerdt, and Joseph Daniels, Essen-Ruhr, Germany. Patent 2,075,992.

Machine Tool (Surface Grinder). William H. Feeney, East Providence, R. I., assigned to Brown & Sharpe Mfg. Co., Rhode Island. Patent 2,075,179.

Machine for Crimping Metal. John E. Dressing, St. Louis, Mo. Patent 2,076,228.

Oscillating Grinder. Frederick D. Van Norman, Springfield, Mass., assigned to Van Norman Machine Tool Co., Springfield, Mass. Patent 2,075,508.

Parts and Mechanisms

Fluid Pump. Henry J. Gerdau, San Francisco, Calif. Patent 2,075,843.

Molten Metal Pump. Wayne A. S. Harmon, Los Angeles, Calif. Patent 2,075,895.

Hydraulic Load Producing Means. Gerd S. von Heydekampf, Chester, Pa., assigned to Baldwin-Southwark Corporation, Del. Patent 2,075,968.

Speed Reduction Power Unit. Clifford E. Broome, Euclid, Ohio. Patent 2,076,015.

Screw. Ernest Payne, Chicago, Ill., assigned to Central Screw Co., Chicago, Ill. Patent 2,076,041.

Race and Roller Transmission Mechanism. John O. Almen, Royal Oak, Mich., assigned to General Motors Corp., Detroit, Mich. Patent 2,076,057.

Variable Speed Gearing. John Wooler, Ruislip, England. Patent 2,076,438.

Processes

Method of Forming a Volute Spring. Harry A. Knox, Davenport, Iowa. Patent 2,075,815.

Gearing and Method of Conditioning the Same. Matthew B. Morgan, Detroit, Mich., assigned to The Timken-Detroit Axle Co., Detroit, Mich. Patent 2,075,995.

Method of Heat Treating Plane and Unidimensional Curved Metallic Surfaces. Augustus B. Kinzel, Flushing, N. Y., assigned to Union Carbide and Carbon Corp., New York. Patent 2,076,515.

Tools and Attachments

Means for Separating Elements from Shafts. William H. Curtiss, East Orange, N. J. Patent 2,075,792.

Art of Drawing (Design of Draw Dies). John M. Hothersall, Brooklyn, N. Y., assigned to American Can Co., New York, N. Y. Patent 2,075,847.

Optical Drilling Tool. Ernst Leitz, Jr., Wetzlar, Germany, assigned to Ernst Leitz, G.m.b.H., Wetzlar, Germany. Patent 2,075,856.

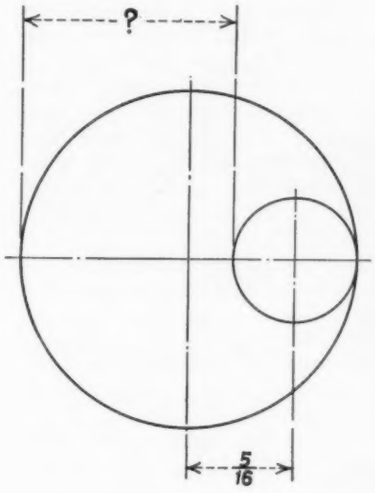
Electrically Operated Sizing Device (Caliper). Arnold L. Johnson, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,075,902.

Rotary Cutter. Hugh M. Albee, Orange, Mass., assigned to The Leavitt Machine Co., Orange, Mass. Patent 2,076,110.

Distortion Check for Welding Apparatus. Laurence C. Powell, Portsmouth, Va. Patent 2,076,207.

What Is the Dimension?

GEORGE R. SHORE was so interested in the last brain teaser "A Drawing Puzzle" (*AM*—Vol. 81, page 10) that he has submitted the problem below. Let us know if you have a solution. A list of successful contributors will be published with the solution in a forthcoming number.



Oversize Taps

HERBERT M. DARLING
Superintendent, Wells Tool Company

IN HIS articles on Die Design and Die Making" (*AM*—Vol. 80, page 257), E. G. Marshall suggests that there is an advantage in the use of 0.003-in. oversize taps for all tapped holes in tool steel parts that are to be hardened. In discussing the matter in an article under the above title (*AM*—Vol. 80, page 1048), Stanley Baldwin brings up the practical difficulty in procuring such taps.

My solution of the matter is to use stove-bolt taps, which can be bought from stock in sizes from 3/16-24 to 3/8-16 inclusive. Care should be taken to specify 1/4-20, as several tap makers still stick to the old standard of 1/4-18, while others furnish taps with either thread.

Few toolmakers and machinists seem to be familiar with stove-bolt taps, but they are very useful when a free fit is wanted. These taps have a plus tolerance of from 0.0025 to 0.0055 in. on the outside diameter and from 0.0025 to 0.0040 in. on the pitch diameter over basic sizes. The regular Class II free fit series of commercial screws have a tolerance from basic size to minus 0.0035 in.

But don't forget that a lot of diemakers resort to a piece of waste wrapped around an ordinary tap, which makes it cut from 0.002 to 0.003 in oversize.

Mr. Baldwin also speaks of using a No. 18-18 tap ahead of a 5/16-18 tap. That is a good stunt, but it is a special size with most tap makers. A No. 14-20 tap is a good starting size for 1/4-20 tap.

Nearly all tap makers furnish "serial" sets of taps that should be in every tool room, for tapping tough or hard materials where accuracy is important. The No. 1 tap is used to rough out the threads and is followed by the No. 2, which is larger in both pitch and outside diameters. Finally No. 3 is used to finish the thread to full size, thus distributing the work among three taps. These sets should not be confused with the ordinary sets of taper, plug and bottoming taps, which are all the same size, but the points are tapered differently. The use of the serial taps will eliminate any need of using a No. 18-18 tap ahead of a 5/16-18 tap.

This one is for the Tool Room.
The Cincinnati with Universal
Table is the complete . . .
Tool Room Shaper
THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO
SHAPERS • SHEARS • BRAKES

New Ideas Produce Light-Weight Buses

THE USE of new methods of manufacture by one company, and the use of a comparatively new material by another, have enabled them to meet the paramount requirement of modern bus transportation—lower operation costs. A practical solution of the problem is the use of a lighter weight bus which results in a reduced original cost and reduced maintenance cost in that smaller and standard engines can be used to haul the same number of people, and smaller tires and accessories in general may be used.

Two companies have approached the problem from different angles and in different fields. Sleeper Coaches, Inc., has taken advantage of Dowmetal wherever possible. The result was a 11,500-lb. bus which can be driven by a standard Reo motor. Eight full-size sleeping compartments are provided, each with upper and lower berths. The driver's compartment, separated by a bulkhead from the passenger's section, contains lounge seats for smokers. The frame of this bus, which is some 33 ft. long, weighs but 602 lb. The walls were made of double panels of Dowmetal. To provide insulation, a combination of kapok sheets and corrugated waterproof paper covered with aluminum foil is held with a waterproof cement between the outer and inner wall panels. Ventilation is furnished to each of the berths by individual ducts connected to an air vent which is located at the upper front end of the bus. This air can be heated for winter driving or cooled for summer use.

Mr. George McCarroll in an address before the Detroit Section of the Society of Automotive Engineers stated that "we have found Dowmetal superior to all other structural metals in ease of machining. It bends satisfactorily where liberal bend radii are permitted. It is readily gas and spot welded. It must be suitably protected against salt water, but otherwise is adequately weather-resistant. It will not take a bright polish nor can it be successfully plated, but it does take an excellent decorative and protective coating."

Gar Wood Industries produced a 24-passenger bus under the engineering direction of Wm. B. Stout which was made lighter by adopting new methods of construction with more commonly used material. Lightness was achieved by using square steel tubing throughout the frame. Present-day welding technique permitted such a wholesale welding of a large tubular frame without distortion. The complete frame weighed only 745 lb., the floors, insulation, and lining weighed 750 lb., and the steel and aluminum covering of the bus weighed approximately another 750 lb. The complete bus weighed only 6,500 lb. The light weight of this bus permits the use of a standard truck motor. This motor furnishes sufficient driving power and tests have proved that this bus can be overloaded by an additional 24 passengers with no harm. The extremely low weight permitted a more suitable springing arrangement which makes for more passenger comfort.

Stanley E. Knauss, manager of the Motor Coach Division of the Gar-Wood Industries, Inc., in a talk before the Society of Automotive Engineers at Detroit stated that the sales problem in connection with the light

weight coach was unique. Mr. Knauss said "Operators who realize that the saving of a few cents a mile is a difference between a deficit and a profit are quick to see the advantages of light weight with its attendant lower cost and divorce themselves from previous ideas of associating strength with mass weight. Other operators who do not take the time to study the newer developments or who by habit of many years have come to believe that the mounting of a body on a heavy chassis meant strength, look at the tube framework, shake their heads, and immediately say 'what will happen in the case of an accident?' If our experience with this coach, and similar structures which preceded it, teaches any lesson at all, we must conclude that strength is secured from materials and design, and not from mass weight."

Junk Piles

By Berton Braley

Oh, is there anything so punk
To look at, as a pile of junk?
To see machines, once bright and clean,
Losing their nice metallic sheen
And turning rusty, black and green?
Oh is there any greater blight
Than is a junk-pile to the sight?

You bet there is! And that's a crop
Of obsolescence in the shop!
A bunch of tools that do not function
With ease, efficiency or unction;
An Overhead that's always sunk
Under the weight of "active" junk
Which day by day and hour by hour
Is wasting labor, time and power.
Running, it's true, but, be it said,
Running completely in the red.

When figures show—and prove it straight—
That half our tools are out of date,
Slow, clumsy and refractory
Just cluttering the factory,
A junk pile, by comparison,
Is not a bit embarrassin'.

In fact, to one who runs or reads,
It seems that What This Country Needs
(Or it's a thought that's often thunk)
Is—MORE and BIGGER piles of junk!

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The Right to Work

Many things go to make up Happiness. Some of them are essential. Among these essentials, surely, are the security, the independence and the welfare of self and family. Since, under every social order, every economic system and every political form on earth, the only way to acquire security, independence and well-being is to earn them, men therefore possess the inalienable right to earn . . . which is to say, the inalienable right to work!

Our country, as a free and independent nation, might never have come into being, except for an attack on what we considered our sacred rights. In protest, we denounced the measures that would "cut off our trade" . . . stop the wheels of commerce . . . destroy our opportunity for work.

America is a nation of workers. We built it with the axe and with

CINCINNATI BICKFORD

SAVES 30% for WORTHINGTON

● In the drilling and tapping of these centrifugal pump cases, the new High-Speed Super-Service Radial saves approximately 30% in direct labor as compared with previous methods. The Worthington Pump & Machinery Corporation could reasonably predict this saving for this is their 14th Super-Service Radial at the Harrison, New Jersey works.

One of their 6′ Super-Service Radials is regularly drilling 1-1/64″ holes in bronze condenser tube heads at the remarkable penetration rate of 42.9″ per minute. This speed is all the more impressive when one considers the rigid manufacturing standards to which Worthington products are held.

The satisfying performance and savings accomplished by the Super-Service Radial in the country's leading plants result from its long lived accuracy and its distinctive convenient control. Every lever is always within easy reach at the operating position.

May we send complete details?

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SUPER-SERVICE RADIALS

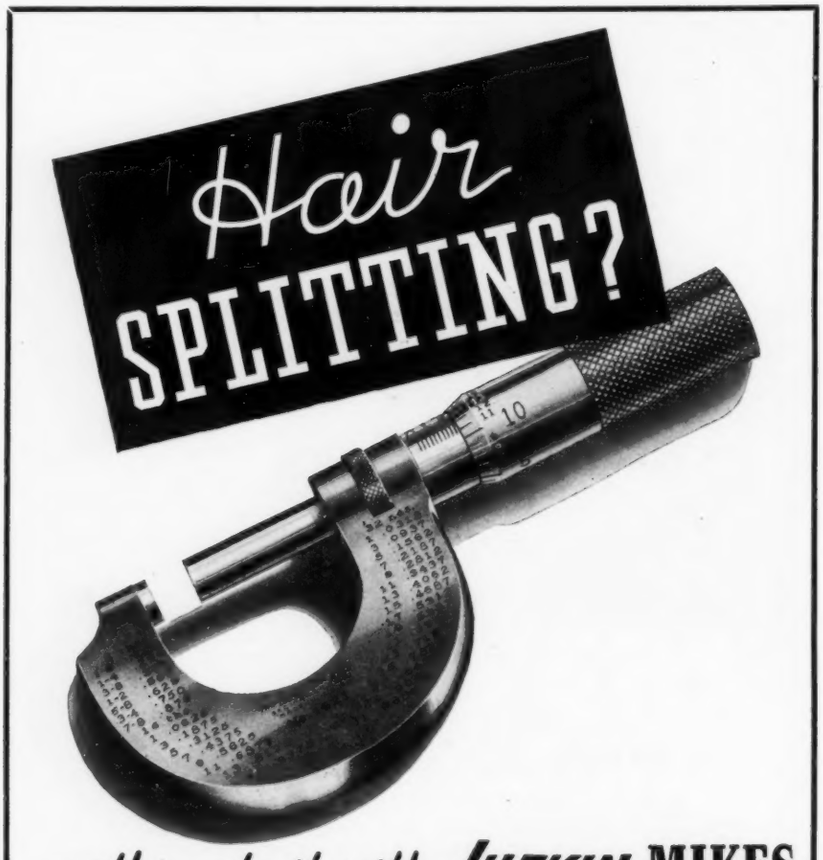
the plow. The sweat of labor cleared our forests—tilled our lands—gathered our crops—produced our goods—built our roads—reared our cities—fashioned our civilization.

Work is the cornerstone of our existence. We want to work—that we may win through to that goal of happiness—and we proclaim our right to do so. Whether one shall work—how one shall work—when one shall work—has from the earliest days of our national existence been the acknowledged right of each one of us to decide for himself, with no man's interference.

Above all, in times of economic recovery, our consideration of human rights—our concern for national welfare—must make us united on the principle that every man and every woman should be given work. For how else can this or any other country be restored?

We must recognize the need to help as many of our people as possible to improve their ways of life—to retain all reasonable personal liberty—to pursue the happiness which comes with security.

Abstracted from Talk No. 19, broadcast January 24, 1937, on the General Motors Sunday Radio Hour.



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TRY TO SPLIT A HAIR 30 TIMES! This is the accuracy to which LUFKIN standard micrometers are made—measuring to within 1/10,000 of an inch. They speed up shop time, for the markings are clear and easy to read even to this accuracy.

LUFKIN micrometers save money in the long run, for they are built to last, and those who use them agree, one and all, they DO last. Mechanics know from experience that LUFKIN Mikes stand up on the job year after year. They are made in all sizes from 1 to 12 inch.

When you need a really good micrometer, step into your favorite hardware or tool store and ask them to show you a LUFKIN.

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PRECISION TOOLS—TAPES—RULES

SAGINAW, MICHIGAN NEW YORK CITY

NEW BOOKS

TOOL STEEL SIMPLIFIED.—*By Frank R. Palmer, assistant to the president, The Carpenter Steel Company. 311 pages, 6x9 in., extensively illustrated by charts, diagrams and half-tones. Published by The Carpenter Steel Co., Reading, Pa. Price $1.*

Here is a volume which the author calls a handbook but which is very much more. There is no question but that every toolmaker, and four out of five metallurgists, will know more about tool steels and their treatment after reading it. Instead of being the usual dry treatise on a technical subject, Mr. Palmer's "handbook" is written in a style that holds one's interest and stimulates him to keep on reading once he has started.

Although the author talks principally about the Carpenter "matched set" of tool steels and how they should be used and heat-treated, he has included much information that is applicable to tool steel treating and testing in general. A lot of the mystery surrounding hardening practice is dispelled in simple fashion.

The book has five parts, each of which contains several chapters. Part I talks about tool steel, what it is, and what its chemical and physical characteristics are. Part II tells of the "matched set" method of selecting the right steel for a given application. Part III discusses heat-treating and testing methods and equipment. Part IV is full of practical information on design, hot acid testing, timbre tests, spark tests, furnace atmospheres, quenching and trouble shooting. The last part contains tables and an index.

•

DIRECTORY OF NEW ENGLAND MANUFACTURERS.—*Published with the editorial cooperation of the New England Council by George D. Hall, Inc., 665 Boylston St., Boston, Mass. Price $15.*

Seventeen thousand New England manufacturer's are listed, together with the names of the principal officers, a description of the product

made, number of factory employees, capital and location of plants or branch offices.

The same concerns are classified by state, city and town in a second section of the directory. The third section is of particular value to Purchasing Agents as all products are listed alphabetically, together with the names and addresses of the makers. There is also a Brand Name section.

This edition was issued January 2, 1937, and will be current for two years.

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DIAMENT WERKZEUGE (DIAMOND TOOLS). *By Paul Grodzinski. Illustrated. Cloth bound. Sold by M. Krayn, Berlin W35, Woyrschstrasse 11. Price 6.50 RM.*

In this book all industrial uses of the diamond and other jewels, either natural or synthetic, are presented and compiled. It is profusely illustrated and all the necessary data for the use of the non-technical operator and the technical designer are clearly presented in some 30 tables.

•

TOLERANZEN UND LEHREN (TOLERANCES AND GAGES). *By P. Leinweber. 115, 6x9 pages. Paper Cover. Illustrated. Published by Julius Springer, Berlin W9, Linkstrasse 22-24. Price 6.60 RM.*

The author develops the thesis that inasmuch as the limits of the machines and the material to be used in a new design are known there is no need to wait until the first parts are going through the shop to establish tolerances and inspection gages. Furthermore, inasmuch as the final form of the design is a combination of geometrical shapes the layout and decision as to tolerances and gages for inspection should be a part of the original design.

It is the purpose of this book therefore to provide the fundamental principles of tolerance calculation and gage design. A resume of fundamental inspection methods is given with a discussion as to the importance of tolerances at various stages of manufacture and in the various dimensions in any part.

A considerable portion of the book is devoted to a discussion of the types, uses and limitations of the various gages. The gages illustrated are those primarily devoted to production work, many of them being of the go and no-go type. The text is in the German language.

•

TECHNISCHE OBERFLACHENKUNDE—*By Gustav Schmaltz. 285 pages. 6½ x 10 in., fully illustrated. Paper-covered. Published by Julius Springer-Berlin, W. 9, Linkstrasse 22-24. Price 43.5 RM (Bound 45.6 RM).*

In this work the author summarizes and discusses his own work and the work of various investigators in certain fields of engineering. He attempts to correlate these efforts and to show their application to the field of surface studies of materials, it being his purpose to combine in this one book the present knowledge of the surface limits of physical bodies with the work of machining parts.

The first portion of the book is devoted to a discussion and explanation with considerable illustration of

★Smooth acceleration and deceleration

★Accurate Stepless Speed Control . . . Minimum to Maximum in either direction

★Automatic Load Indication and Overload Protection

★Flexible Location with Hand, Automatic or Remote Control

★High Efficiency, Low Maintenance

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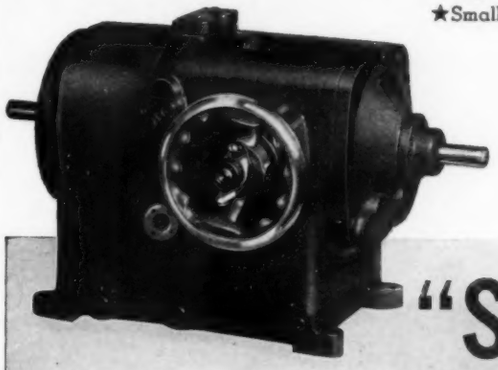

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the various methods of examing the surfaces of solid bodies. These methods include among other things, microscopic, macroscopic, hot-wire, airflow, and polarized light methods of studying surfaces, and mechanical profile measuring devices. In the second portion of the book, he discusses the methods of presenting profile curves and enters into discussion of the properties of the types of profile curves obtained from different types of machine surfaces. From this basis the argument is continued that standards for surfaces should be established for each type of machine operation. Included in the argument for this standardization are illustrations and tables indicating the various types of profile curves and the average amounts of roughness encountered in the various machining operations. The book then enters into a discussion of the effect of these various surface conditions in relation to other questions such as abrasion, wear, corrosion and moisture effects on the structure of the part.

In conclusion, the author discusses the necessity for standard technique of surfacing and advances a system of measuring profile curves upon which the standard shall be based. He presents in the closing portion of the book a chart giving proposed limits for surface roughness for each of the various types of operation encountered in manufacturing processes of today.

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TRADE PUBLICATIONS

ANCHORAGE DEVICES. The Rawlplug Co., Inc., 98 Lafayette St., New York, has published Booklet No. 37 giving information on how various types of anchors develop their holding power, the advantages of each type, the correct way to install them, safe working loads, hole sizes for best results, tips on how to drill accurate holes in masonry and other useful data.

AIR TOOLS. The Rotor Air Tool Co., 5704 Carnegie Ave., Cleveland, Ohio, has issued a 20-page catalog, No. 15, listing and describing the standard models of Rotor air tools. A complete line of these tools is available.

BORING TOOLS. A 6-page folder, illustrating and listing GATCO rotary bushings, boring cutters, boring blocks and boring bars, is offered by Giern & Anholtt Tool Co., 1312 Mount Elliott Ave., Detroit, Mich. Rotary jig and pilot bushings for guiding boring bars, reamers, and cutting tools requiring guide bars are described in detail.

CORROSION OF CAST IRON. The International Nickel Co., Inc., 67 Wall St., New York, N. Y., has published an eight-page bulletin, "Some Consequences of Graphite Corrosion of Cast Iron," a reprint from a "Metals and Alloys" article by W. A. Wesley, H. R. Copson and F. L. LaQue. This investigation deals with the mechanism of a type of corrosion that results in formation of a surface layer of residual graphite.

COMMON LABORERS. Bulletin No. 627, prepared by the Division of Wages, Hours and Working Conditions of the Bureau of Labor Statistics, United States Department of Labor, discusses the entrance rates and full-time hours of common laborers employed by Cities as of Septem-

ber 1935. Copies are available from the Superintendent of Documents, Washington, D. C.; price, 10 cents per copy.

COLLOIDAL GRAPHITE. The Acheson Colloids Corp., Port Huron, Mich., is offering copies of Technical Bulletin No. 260, which is available in two sections. Section A260.1 deals with the subject of impregnation with "dag" colloidal graphite from the theoretical standpoint, while Section B260.1 deals with the practical side of this application.

CHAIN CONVEYORS. Baldwin-Duckworth Chain Corp., Springfield, Mass., is offering a 14-page bulletin describing conveying equipment for high temperatures. This bulletin is based on the Crime File Dossier type of detective story which came out some six or eight months ago.

DIAMONDS. The advantages of "Diamond-K" industrial diamonds are discussed in a folder offered by Kobel Diamond Tool Co., 1208 Oakman Blvd., Detroit, Mich.

ELECTRODE HOLDER. Specification Bulletin No. 321, published by Lincoln Electric Co., Cleveland, Ohio, illustrates and describes the Type T electrode holder. Metal parts of this 19 oz. holder are cadmium plated.

FIRE EXTINGUISHERS. Underwriters' Laboratories, Inc., 207 East Ohio St., Chicago, has published a report on "Fire Tests in Small Closed Rooms with Automatic Bulb-Type Carbon Tetrachloride (Vaporizing Liquid) Fire Extinguishers." The report is dated March 5, 1937.

GRAY IRON. Publication of two booklets containing information regarding the Gray Iron Foundry Industry has been announced by Gray Iron Founders' Society, Inc., 1010 Public Square Bldg., Cleveland, Ohio. These booklets, "New and Useful Facts About Gray Iron" and "O. K. After Machining," may be obtained free of charge by any purchasing agent on request to his local foundry.

GRAPHITIC STEEL. The Steel and Tube Division of The Timken Roller Bearing Co., Canton, Ohio, has issued a 4-page folder describing the advantages of Timken graphitic steel. This material combines the free machining qualities of cast iron with the high strength and response to heat-treatment of steel.

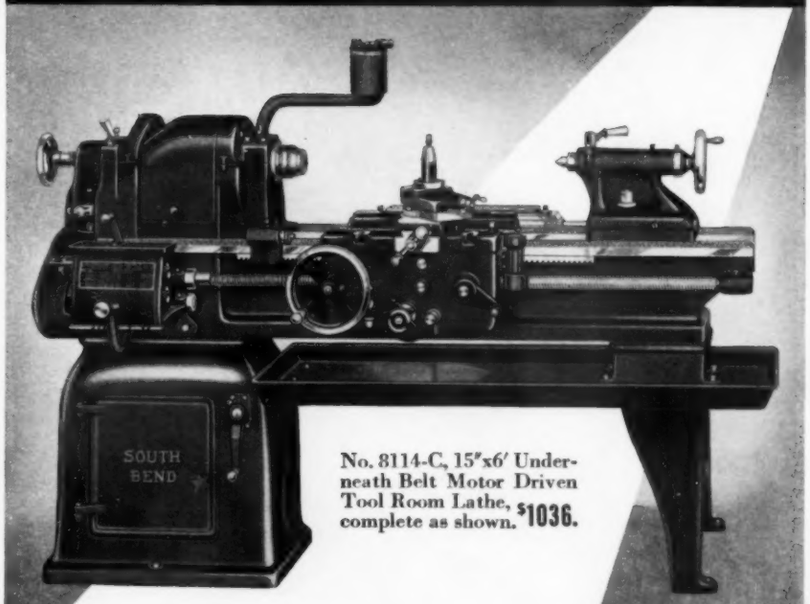
GAS GENERATOR. Bulletin No. 95, published by The Wellman Engineering Co., Cleveland, Ohio, illustrates and describes the Wellman-Galusha clean-gas generator for industrial use. Typical performance data are given and the advantages of the generator are discussed.

GAGE. A 16-page circular describing John-Sons roll thread snap gages, Tri-Roll gages and a combination of taper plain and thread plug and ring gages has been published by Pratt & Whitney Division, Niles-Bement-Pond Co., Hartford, Conn. Photographs show gages in use.

HIGH CYCLE ELECTRIC TOOLS. A 12-page bulletin, "The Facts About High Cycle Electric Tools," is offered by the Rotor Air Tool Co., 5704 Carnegie Ave., Cleveland, Ohio. The advantages of high cycle tools are discussed in detail and standard models are illustrated and listed for the convenience of the reader.

INSTRUMENTS. A line of miniature panel instruments, for all types of industrial applications, are described in Catalog Section 43–350 offered by

NEW 1937
SOUTH BEND *Precision* LATHES



No. 8114-C, 15″x6′ Underneath Belt Motor Driven Tool Room Lathe, complete as shown. $1036.

THE new 1937 Series of South Bend Back-Geared, Screw Cutting Precision Lathes with Double Wall Aprons and hardened and ground headstock spindles are recommended for the finest and most accurate work in the tool room, machine shop, manufacturing plant, and laboratory. Offered in sizes from 9″ to 16″ swing, in bed lengths from 3′ to 12′, Underneath Belt Motor Drive, Countershaft Drive and Pedestal Motor Drive. Stocks of most sizes carried in all principal cities.

Some South Bend Lathe Stores in the U. S.
C. B. Burns Mchry. Co., 541 W. Wash. Blvd., Chicago, Ill.
A. C. Colby Mchry. Co., 183 Center St., New York, N. Y.
Reynolds Mchry. Co., 171 Pine St., Providence, R. I.
Lee Mchry. Co., 6318 E. Jefferson Blvd., Detroit, Mich.
W. A. Voell Mchry. Co., 1533 No. 16th St., Milwaukee, Wis.
Reynolds Mchry. Co., 2034 East 22nd St., Cleveland, Ohio.
The MacKenzie Mchry. Co., 36 Oliver St., Boston, Mass.
W. B. Rapp Mchry., 132 No. Third St., Philadelphia, Pa.

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WRITE FOR NEW CATALOG
Catalog No. 96 illustrates, describes, and prices the new 1937 Series of South Bend Precision Lathes in all sizes and styles. A valuable book for the shop man, engineer, and plant executive. Sent free, postpaid, upon request.

MODERN LATHES FOR MODERN INDUSTRY

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

INDUSTRIAL DIAMONDS. An 8-page booklet published by F. F. Gilmore & Co., 112 Dartmouth St., Boston, Mass., lists and describes industrial diamonds and diamond holders for truing all types of grinding wheels.

INDUCTION MOTORS. Bulletin No. 1600, offered by Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, describes the line of polyphase wound-rotor or slip-ring, ball-bearing, induction motors.

INDUCTION FURNACES. The Ajax Electrothermic Corp., Trenton, N. J. has published a 15-page bulletin describing large coreless induction furnaces for melting ferrous and non-ferrous metals. This bulletin, No. 11, supersedes Bulletin No. 6, and illustrates and describes several new units.

LUBRICATION. The Shell Petroleum Corp., Shell Building, St. Louis, Mo., announces publication of a series of booklets entitled "Panorama of Lubrication." The first three booklets of this series are now available. Text matter is given over to non-technical information with regard to the manufacture and application of lubricants.

LUBRICATION. Bulletin D, issued by the Bijur Lubricating Corp., 22-08 43rd Ave., Long Island City, New York, is a 15-page booklet defining the field of application of centralized, forced feed, automatic lubrication systems. The Bijur meter unit is described in detail and photographs show machines on which this system has been applied.

LIGNUM-VITAE PRODUCTS. "Lignum-Vitae Fact Flashes" is the title of a series of bulletins to be offered by Lignum-Vitae Products Corp., 96-100 Boyd Ave., Jersey City, N. J.

LIFT TRUCKS. Folder No. 322, offered by Lewis-Shepard Co., 267 Walnut St., Watertown, Boston, Mass., describes lift truck platforms and lift trucks available for interior transportation of goods, materials and products.

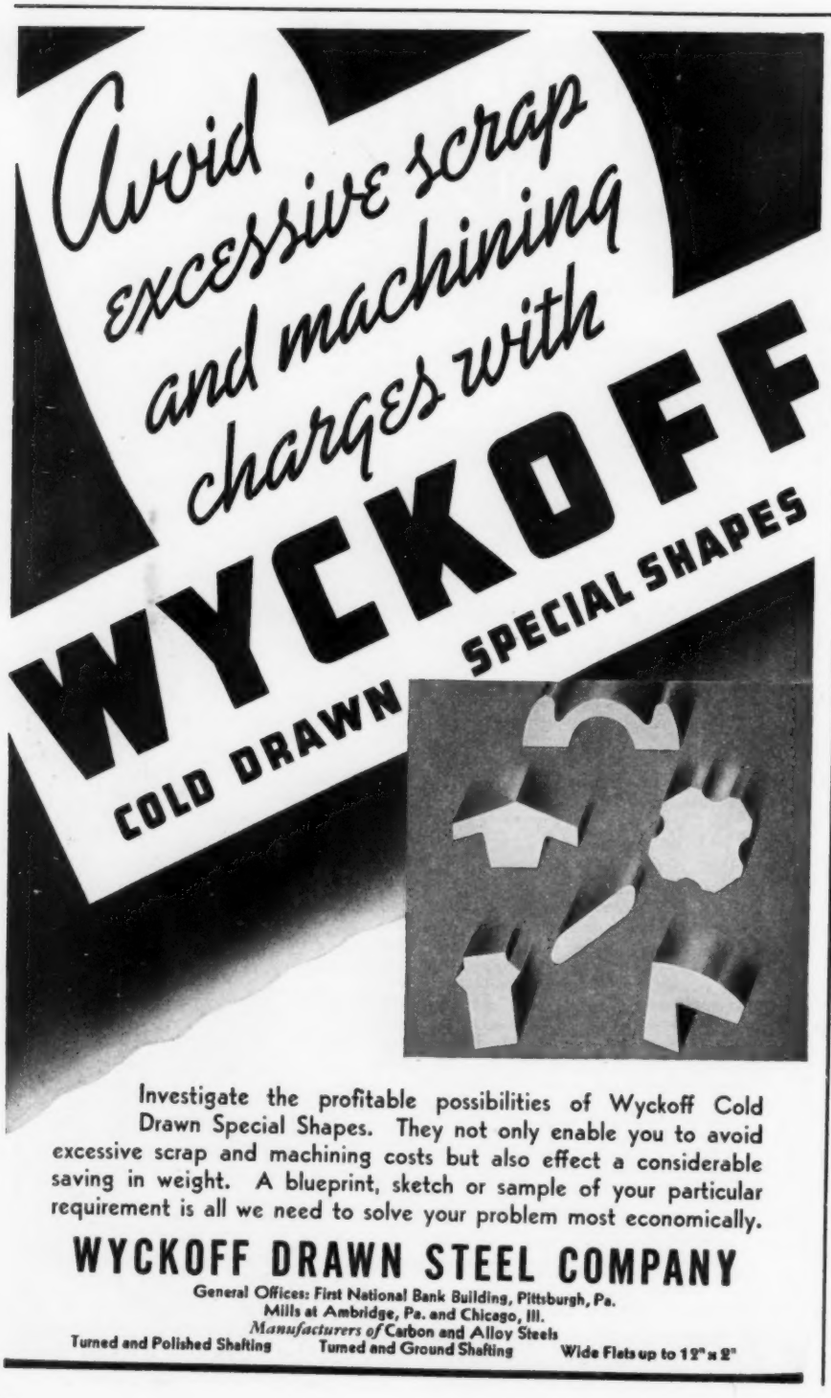
LANDIS CHECK BOOK. The Landis Machine Co., Waynesboro, Pa., has published the "Landis Check Book of Threading Costs and Production Records," which makes available reliable cost and production data for the users of thread cutting and tapping equipment. Each page of this book is devoted to a practical threading problem.

MAGNETIC BRAKE. Stearns Magnetic Mfg. Co., Milwaukee, Wis., is offering Bulletin No. 600 describing the Style DM magnetically operated brake. This unit operates through a keyed shaft, geared directly to the operating elements.

PROCESSING EQUIPMENT. Products Bulletin No. 103, offered by Edge Moor Iron Works, Inc., 30 Rockefeller Plaza, New York, N. Y., lists and describes special fabricated processing equipment.

PUBLICATION INDEX. Research Series Bulletin No. 55-A, published by Purdue University, Lafayette, Ind., lists the publications of the Engineering Experiment Station and the Engineering Extension Department of the University, from 1917 to 1936.

O K TOOLS. A price change notice, applicable to catalog No. 11, has been issued by the O K Tool Co., Inc., Shelton, Conn. This change notice is to be effective April 1, 1937.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OIL BURNERS. Simplex oil burning systems of the horizontal rotary type are described in Bulletin No. 119-37, offered by Simplex Oil Heating Corp., 30 Church St., New York. Various units are described and capacities are tabulated.

OXIDATION DATA. Technical Bulletin No. 10, offered by the Steel and Tube Division of The Timken Roller Bearing Co., Canton, Ohio, presents a series of data on oxidation at 1,000 F., and 1,250 F. and 1,500 F. on 13 different steels. This bulletin will be of particular interest to designers and operators confronted with oxidation problems.

REFRIGERATING UNITS. The Carbondale Division, Worthington Pump and Machinery Corp., Harrison, N. J., has published Bulletin No. 1121 describing a new line of self-contained, low-pressure refrigerating units. These units are recommended for both air-conditioning service and general refrigerating purposes.

STRIP HEATERS. Type LV and LEV welded vane electric strip heaters are illustrated and described in catalog sheet TC30-Page 13, offered by Harold E. Trent Co., 618-640 N. 54th St., Philadelphia. Photographs of typical installations are shown.

SUSPENDED MAGNETS. A bulletin describing various types of suspended circular, rectangular and hand magnets has been published by Stearns Magnetic Mfg. Co., Milwaukee, Wis. This bulletin gives application data and describes each of the various models.

SHOP LIGHTING. Safe Practices Pamphlet No. 22, on the subject of "Industrial Shop Lighting," has recently been published by National Safety Council, 20 North Wacker Drive, Chicago. This pamphlet is based on the accident prevention experience of a number of employers and gives considerable information regarding recommended lighting practice.

SCREW DRIVER BITS. Complete information covering 125 screw driver bits for thirteen of the more widely used electric, air and spiral screw drivers is given in Reference Manual and Catalog No. 9, recently published by The Apex Machine & Tool Co., Dayton, Ohio. Information given applies both to Apex-Phillips screw driver bits for Phillips recessed head screws and to Apex bits for slotted head screws.

TOOL GRINDER. A 4-page bulletin, describing the Universal Tool and Cutter Grinder, is offered by Oliver Instrument Co., Adrian, Mich. Setups for various types of tools and cutters are illustrated and specifications are given for the machine.

TONCAN IRON. The Republic Steel Corp., Cleveland, Ohio, has published a booklet, "The Path to Sheet Metal Permanence." This 20-page booklet contains more than 60 photographs showing uses for sheet metal in wide variety of applications. Information on rust-resistance, forming and welding properties, physical properties and constants, forms, finishes, sizes and gages are given.

UNIVERSAL GRINDER. Catalog No. K-37, offered by the Landis Tool Co., Waynesboro, Pa., illustrates and describes the Landis 12 x 28 in. universal and tool grinder. With standard equipment, this machine is suitable for many surface grinding and internal grinding operations in addition to the usual external cylindrical operations.

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